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AVIATION

DEC 6 1927

The Oldest American Aeronautical Magazine

DECEMBER 5, 1927 Issued Weekly PRICE 20 CENTS

Army bombers passing over Fort Amador in the Panama Canal Zone

VOLUME XXIII NUMBER 23

Special Features

Metal Wing Spars
The "Atlas" and "Ajax" Engines
Navigating the Ship of the Air

AVIATION PUBLISHING CORPORATION
250 WEST 57 STREET, NEW YORK

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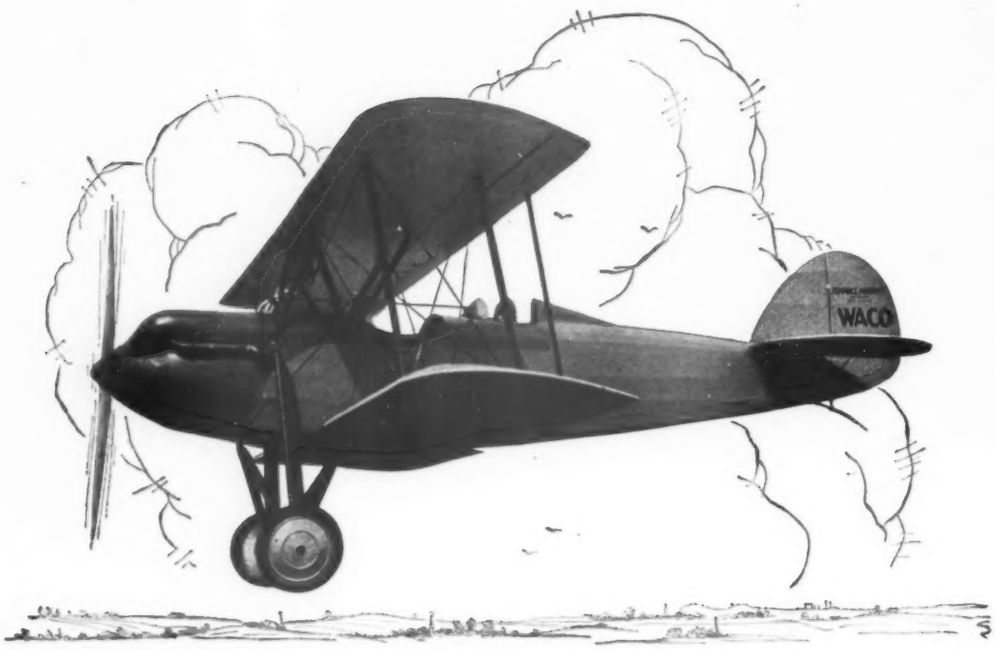

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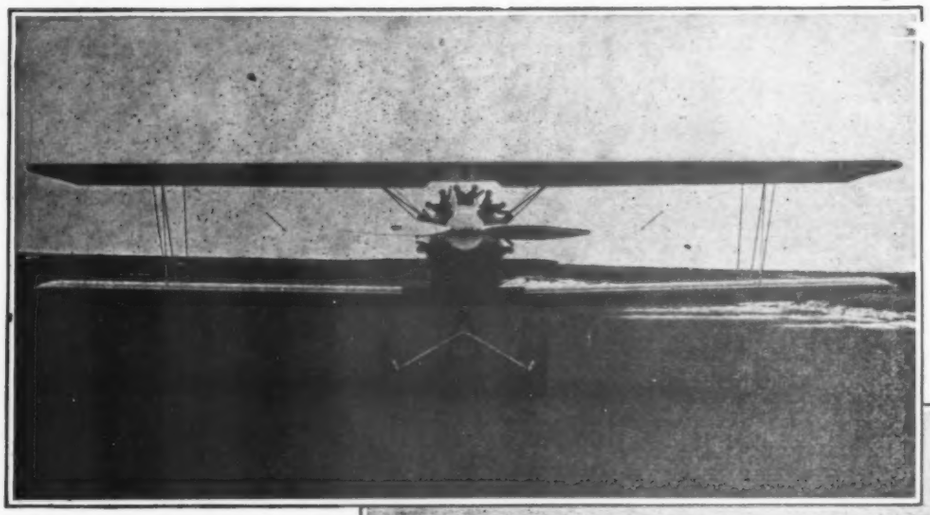

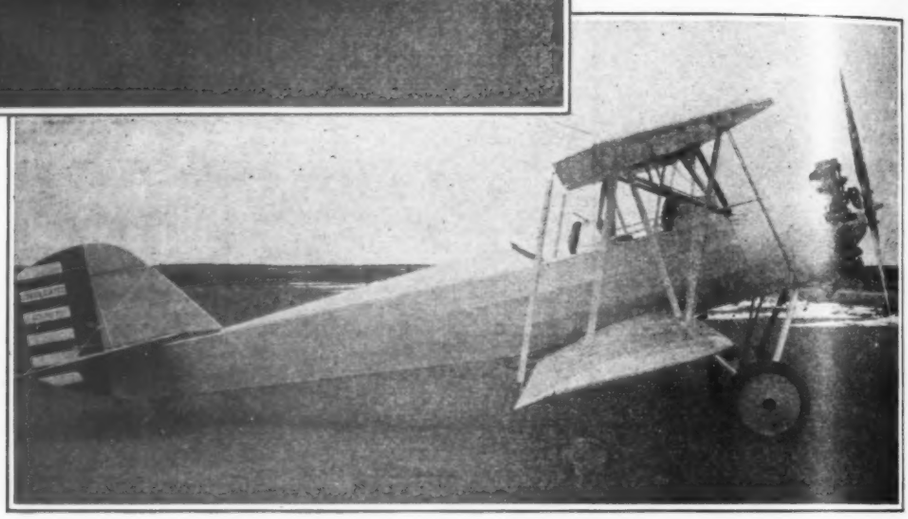

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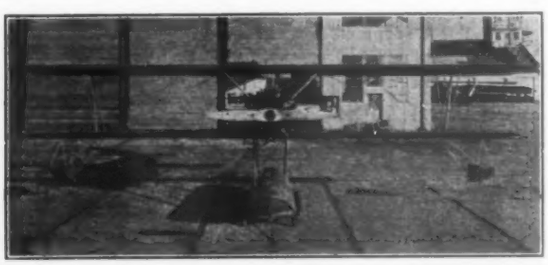

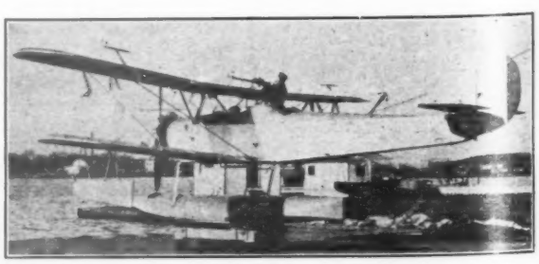

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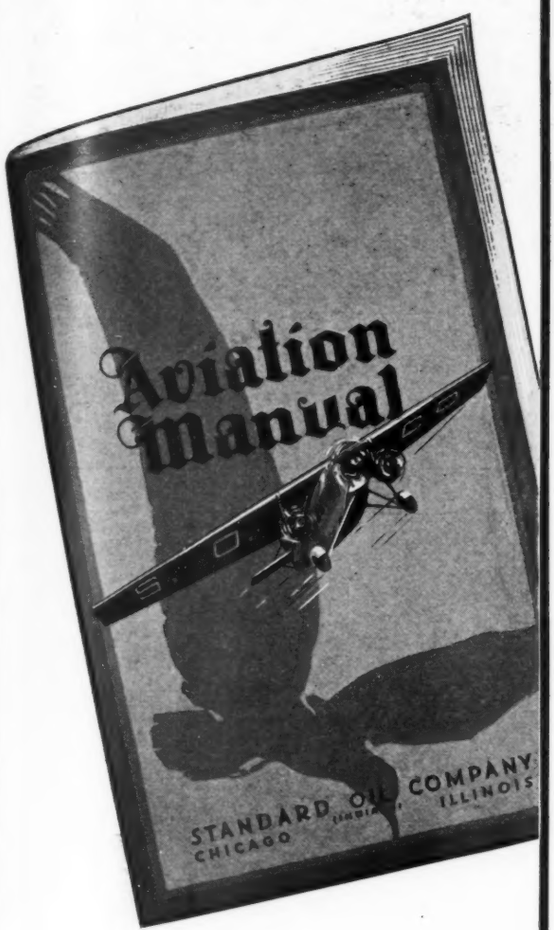

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Most of them were Detroiters. They saw the big, all-metal Ford transport over Detroit every day —several times a day. For one thing, it looked safe. For another, its regular reappearance over Detroit, hour after hour, day after day, was absolute evidence that the plane was safe.

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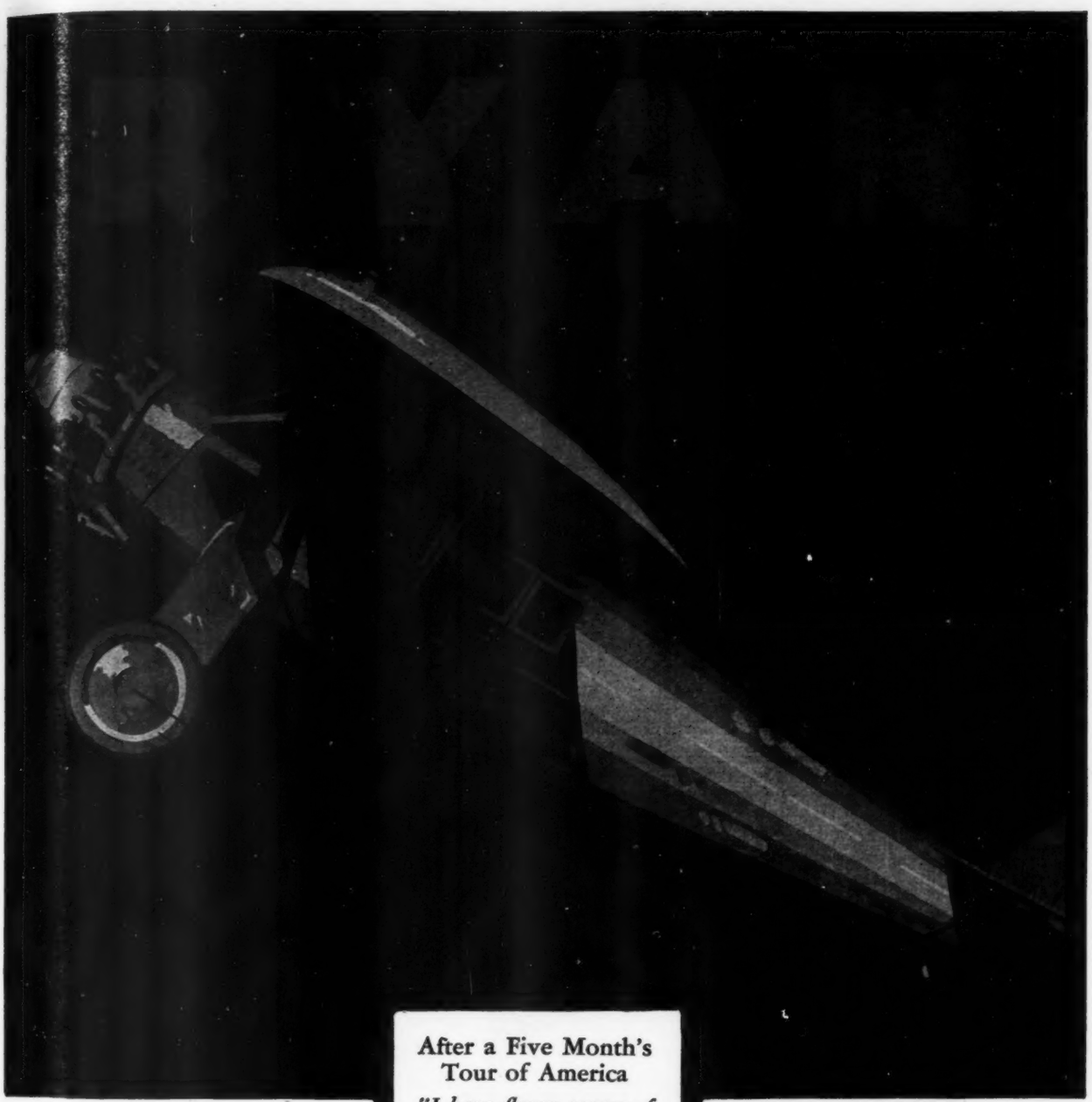

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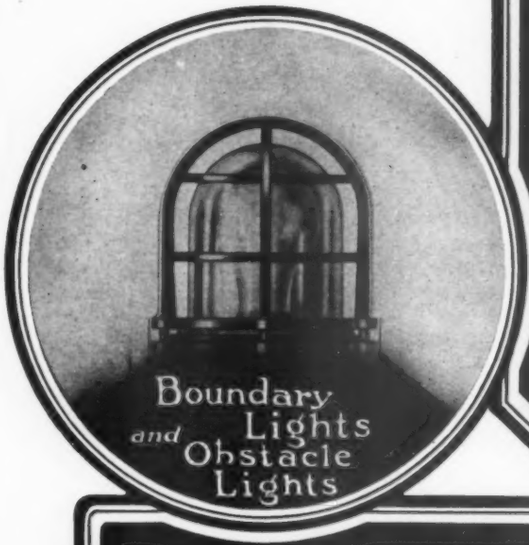

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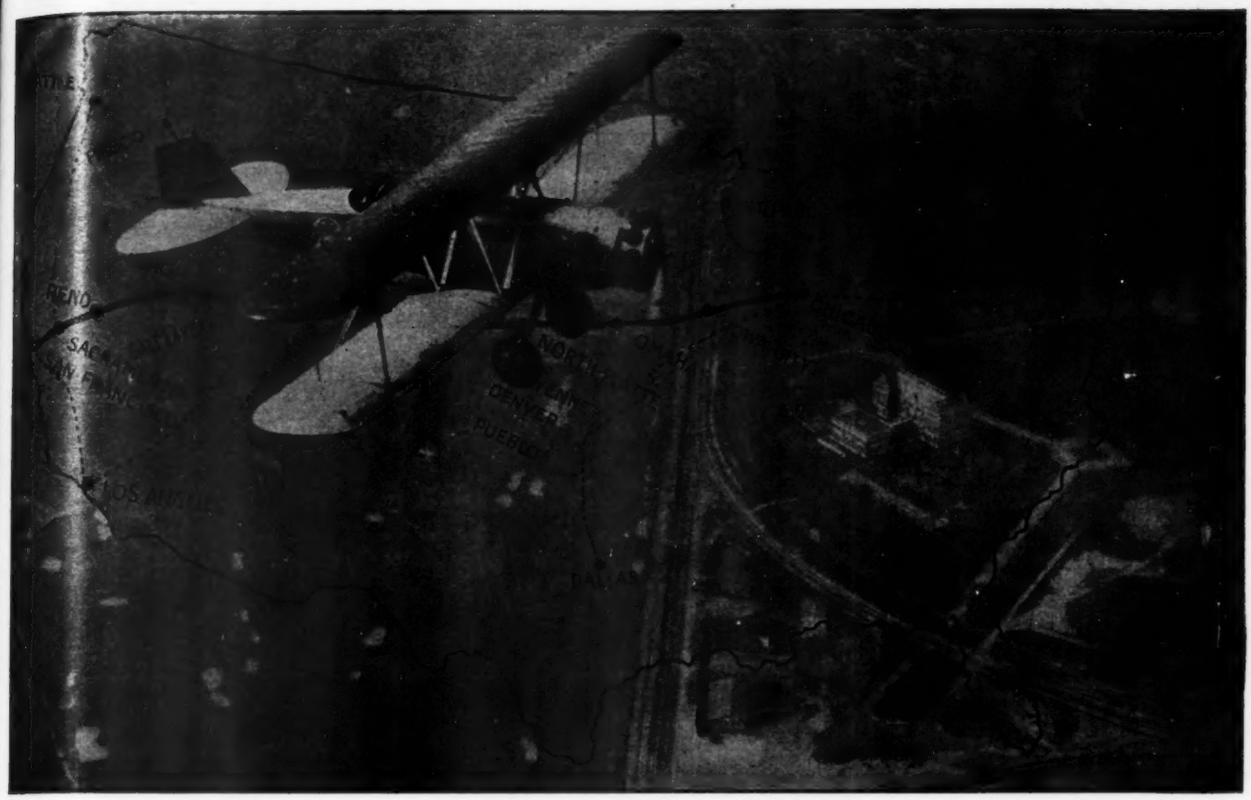

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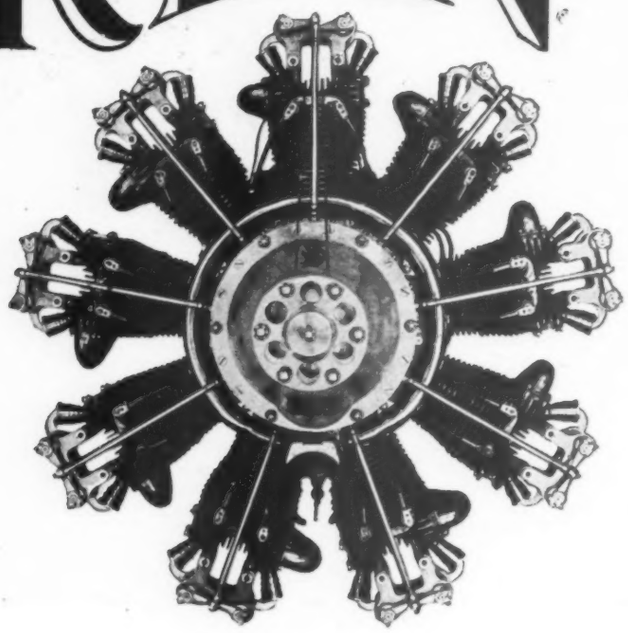

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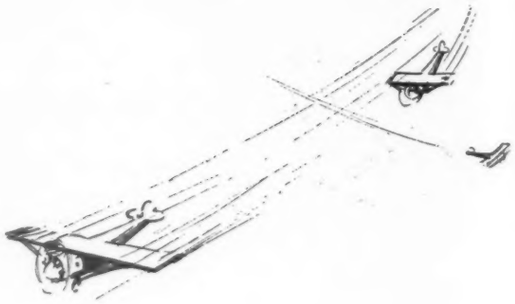

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THE NATIONAL GUARD UP-TO-DATE

The Curtiss O-11 "Falcon"

Time was when the National Guard was considered more or less as a "home-town outfit." Not particularly well equipped, — chiefly of value, perhaps, in local emergencies, strikes, riots.

Then came the World War — and these same National Guard units, in spite of the handicaps of insufficient training and equipment, blossomed overnight into first-class fighting units — writing their history on the battle-fields of France in glorious fashion.

Today the National Guard, efficiently organized, well trained, properly equipped, is an extremely important part of our scheme of national defense. And like all up-to-date military organizations it has taken to the air.

Deliveries are now being made on a quantity order of Curtiss O-11 "Falcons", built for exclusive use of the National Guard. The "Falcon" is the machine which is being supplied in large quantities as the standard two-seater observation and attack plane of the U. S. Army Air Corps.

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AVIATION

The Oldest American Aeronautical Magazine

Vol. XXIII *DECEMBER* 5, 1927 No. 23

Air Speed Indicators

PERIODICALLY THE newspapers announce that a "Stall Proof" plane has been developed and comparatively speaking there is some truth in their statements. What is really meant is that planes can now be kept under control after they have reached their stalling speed and though they sink rapidly they will not necessarily go into a spin and they can be brought back to flying speed by a comparatively gentle glide. This control at speeds below stalling has been attained by proper adjustment of centers of weight to fixed surface areas and by refinements in the size and location of the control surfaces. Developments such as the Handley Page slotted ailerons have still further accentuated the possibility of control below stalling speed. In addition to this wing curves have been developed with high stalling angles and as a result it is now possible to build planes which will be flying in a level position and under apparent control but which actually are settling so fast that they would crash badly unless their forward speed was increased before they reached the ground.

Shock absorbers with larger travel can be developed to meet these new conditions but no matter how far the development is carried airplanes will always have to have a certain amount of forward speed and falling below this speed will cause serious dangers. Various warning devices have been tried with more or less success but the air speed indicator remains the fundamental and most important aid to the pilot in determining whether he is flying at a safe speed.

Unfortunately, however, the air speed indicator has not been brought to a point where it can be absolutely relied upon. One drop of water or one fly in the pitot tube puts it out of commission and yet this instrument is the chief guide to the pilot in the "Stall Proof" plane. In view of this it seems high time to concentrate on the development of this instrument which is so essentially a safeguard to the modern plane.

The Muffler Question

OCCASIONALLY SOME indignant aviator writes in that he has been stopped from operating out of some field or lake because the neighbors had clubbed together and decided that his plane made so much noise that it was a public nuisance. The aviator feels that a great wrong has been done to him and to the cause of aviation and that something ought to be done to make the public more reasonable. Unfortunately the public are still in the majority and in this case they happen to be right. Airplanes with high speed propellers can perhaps never be made entirely quiet but much can be done and, in certain planes, is done, to lessen the nuisance and ultimately airplanes will be quieted just as automobiles have been quieted. The sooner this is done the better for it will be a serious matter if those who do not fly are to consider airplanes a nuisance because of their noise. Already there has been considerable objection to airports on the ground that they injure the value of neighboring residences and unless mufflers or long exhaust pipes are put on planes this impression will gain a widespread hold.

The Washington Conference

THERE ARE going on this week at Washington, D. C., a series of conferences which are of the greatest importance to the progress of civil aviation. They are being held under the auspices of the aeronautics branch of the Department of Commerce and the object is to discuss what has been learned during the past year and to lay out plans for what will be done during the coming year. As far as the general public is concerned there will probably be nothing very spectacular about the conferences, but to those who are really aware of what is going on on the inside of the aeronautic industry they are of paramount interest.

During the past year the Department has been building up an organization which can conduct stress analysis and check details of design. They have also built up a personnel for the inspection of airports and the licensing of pilots. The questions before the conferences this year will deal with the details of the rules under which this organization will operate, but underlying it all will be a broader discussion of whether it is for the best interests of commercial aviation to enforce the laws with greater strictness. During the latter half of the year the laws and regulations have been in actual operation but there has not been time to apply them to every one. There is a general feeling, among those who knew, that many production types of planes have not been engineered with sufficient care. There is also a feeling that training for pilots is inadequate and that at many airports there have been violations of air traffic regulations.

How far existing regulations should be extended and how drastically they should be enforced is a question that requires real statesmanship and a broad point of view to answer properly. Yet, on the answer depends to a very large extent the future of American civil aviation. Our own opinion is that the Department of Commerce adopted the correct policy last year and that any too drastic interference with existing practice would be injurious to development. Ultimately, detailed laws strictly enforced will be necessary and probably beneficial, but during this very formulative stage of aeronautical development it would seem wisest to risk a few accidents for the sake of tomorrow and to avoid the greater risk of binding aviation by too strict an adherence to those rules which seem best to us today.

Metal Wing Spars

A Review of Various Types, Some of Which are New And Others that are Already in Use

By JOHN G. LEE

METAL CONSTRUCTION has been steadily gaining favor both here and in Europe. Metal fuselages are practically universal in this country, and recently there has been a strong trend toward metal wings.

The problem of designing a good metal wing spar is by no means easy. This is because the wooden spar which it displaces has two great advantages which the wooden fuselage had not,—it is cheap and it is light. These advantages are fundamental. However, it has recently been found that a well designed metal spar is actually lighter than the corresponding wooden one. It is not cheaper, in small numbers.

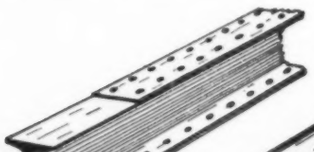


Fig. 1

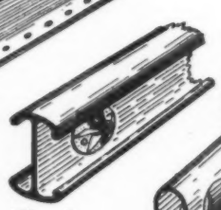


Fig. 2

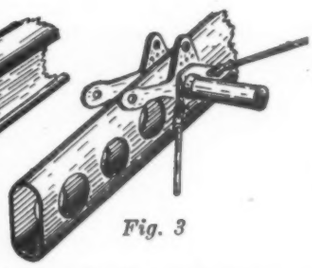


Fig. 3

Metal is the medium for quantity production, and since we have not had quantity production until now, we have not had metal spars.

The best type of metal spars for any given airplane depends on many things. If the plane is for military use, where light weight is essential and cost secondary, an expensive construction can be employed. Whereas, on a commercial plane, where the reverse is the case, something entirely different is necessary. Again, a shop equipped to build welded steel fuselages would tend toward a welded steel spar, and a factory building duralumin flying-boats would naturally be able to build a duralumin plate girder more cheaply than something else. Size is also a factor. A deep spar must be a truss; a shallow one may be a channel, a box, or yet some other type.

The constructions shown in this article were chosen more or less at random. Some are new; some have been in use by different concerns throughout the country. Whenever possible credit has been given to the originator. Of the many metal spars which have been designed, these have been selected to show as many different types of construction as possible, and to stimulate the development of new types and different applications.

First let us consider the very shallow spars. Probably the simplest type that has ever been developed is the extended "I" beam shown in Fig. 1. This is a typical Carnegie "I" section made in duralumin. It is of constant section throughout its length, except where the flanges are cut down at the tips, or a reenforcing cover-plate is rivetted on, as shown in the sketch, at the critical joints. This beam and the one following were originated by the Thomas-Morse Company.

The "I" beam shown in Fig. 2 is better in that its rounded top and bottom fit the contour of the wing, and permit a deeper spar, particularly at the leading edge. Also, the bulbs at the extremes of the flanges distribute the metal where it is needed, and make a more efficient section. The attachment of the wing struts to these spars is interesting. A boss is bolted to either side of the web, and the strut straddles the beam, being pinned to the bosses by a through belt which also carries the lift wires. Thus the loads are taken directly to the neutral axis, and the flanges are not broken. The boss shown in Fig. 2 is made of a steel tube welded to a circular plate, and reinforced by several radial fins. A casting on a hollow cone would be equally satisfactory.

This type of beam is heavy when it is made deep. In addition, at the present time, the extrusion process does not permit of making sections more than 6 in. deep, or thereabouts, and the heat-treating facilities seldom can take a

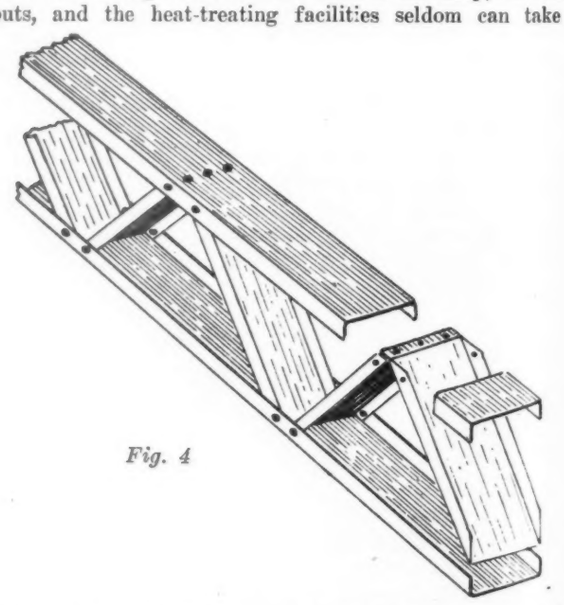


Fig. 4

beam more than 14 ft. long. Its use is therefore somewhat limited. Beams, whose stress is mainly compression and not bending, such as center-section beams, which are really columns, may use this construction to advantage.

Center-section and wing stub beams have been made fre-

quently of round steel tubing, for this very reason, that they are more nearly columns than beams. The beam made in Fig. 3 is made of oval steel tubing, with lightening holes. It is more suited to bending than a round tube, and can take compression almost as well. The strut fitting shown is interesting. The inter-plane struts and wire pulls are taken by a pair of plates, one on either side of the spar. The drag

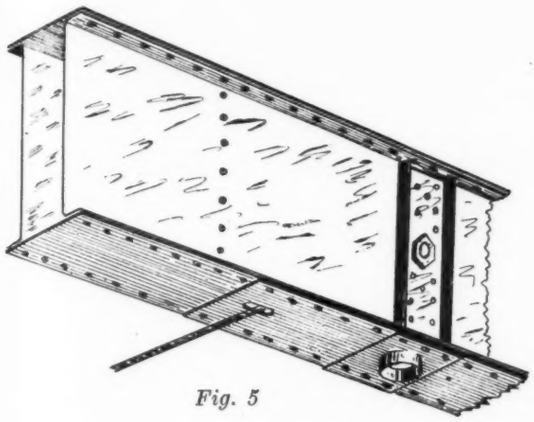


Fig. 5

strut passes through both plates and through the spar, and is retained by a pin and collar (not shown) on the back side. The drag wires pull from a bent plate, which in turn bears upon a collar which is welded to the drag strut, thus completing the assembly.

Most spars of medium depth—six to ten inches—are usually of duralumin plate construction. There is a considerable variety of types. It may be here noted, too, that in these depths it is more difficult to build a metal spar lighter than a wooden one than it is with either the very shallow or the very deep spars.

In Fig. 4 is shown a spar made entirely of duralumin channels, with channel trussing. The web members are all

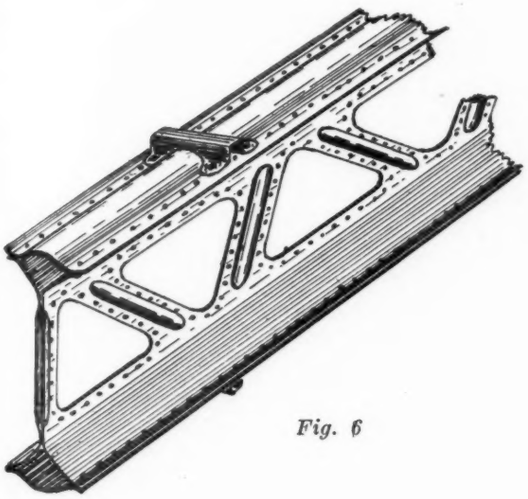


Fig. 6

identical, and are rivetted both to the sides and to the backs of the flange channels, without the use of gusset plates. This spar may be readily spliced and reinforced, and the gauge of the flange members changed from place to place as the load requires.

The beam in Fig. 5 is of the box type, composed of two channel web members back to back, with flat cover-plates. The web members are kept from buckling by small internal bulkheads, suitably spaced. The cover-plates are of varying gauges, reinforced by additional plates at the strut points. The strut fitting shown consists of a plate from which a cup has been formed, which is rivetted to the cover-plate of the spar, thus making a socket for the strut. The lift wire is carried through a hole in the cover-plate to a pin located on the neutral axis.

One difficulty with beams of this type is that flat plates are particularly subject to local crinckling. This can be obviated by the use of large flanged lightening holes in the webs, and by length-wise ribs or "beads" in the cover-plates.

The beam shown in Fig. 6, which was developed by the Naval Aircraft Factory, is a good example. Here the two web plates are made from duralumin stampings such that

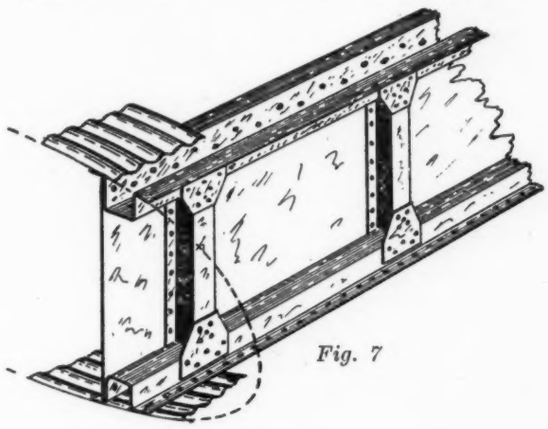


Fig. 7

when assembled they form a Warren truss. The cover-plates are curved, thus eliminating the crinkling tendency, and at the same time giving the flange a hollow cross-section. The thickness of the web and cover-plates vary as the stress requires. Probably the greatest objection to this particular beam is the amount of hand rivetting required. The cover-plates could be rivetted on by machine, but the web diagonals require hand work.

In all metal beams one of the great difficulties is the attachment of the ribs. On the beam in Fig. 6 the ribs were made of duralumin trussing, the cap-strips being channels. These cap-strips are rivetted over the short channel section

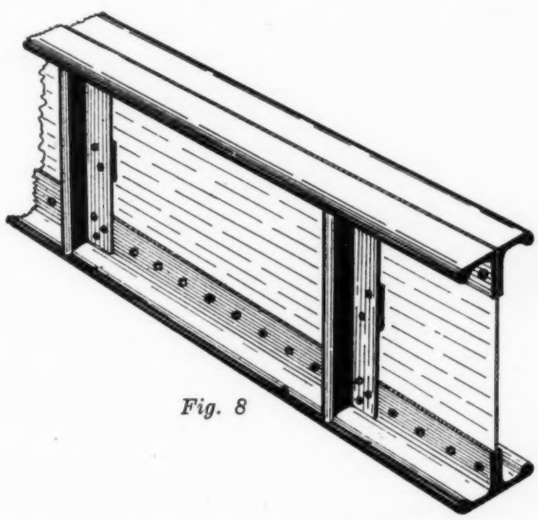


Fig. 8

which is rivetted to the beam flanges. The ribs were made in three sections, leading edge, trailing edge, and center, to facilitate this assembly. With steel beams, plates can be brazed or soldered on, after heat treatment, and the ribs rivetted to these. With duralumin the usual practice is to rivet a vertical angle to the beam, and rivet the ribs to the angle.

The plate girder shown in Fig. 7 is interesting, in that

when completed all the members are closed and of hollow cross-section, which is a very efficient and a very neat construction. The girder consists of two "U" shaped flange members, connected by a flat plate web on one side, and reinforced by frequent vertical "U" channels rivetted to the plate. The beam is intended chiefly for metal covered wings, where the covering serves to close the flange members as shown in the sketch. With corrugated covering a flat or beaded plate may be inserted between the flange and the corrugated skin which adds considerably to the strength of the girder.

Fig. 8 shows another plate girder made by rivetting extruded duralumin angles to either side of a flat web plate.

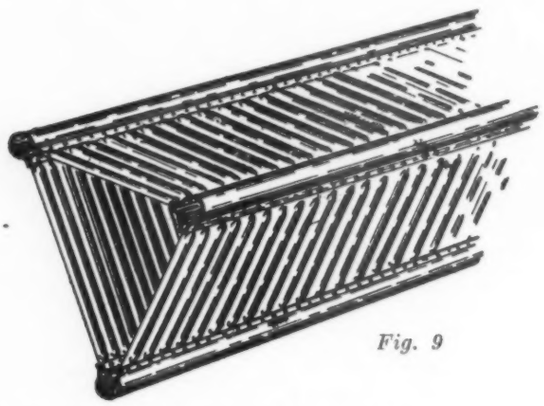


Fig. 9

Note the vertical stiffening angles to which the ribs may be attached. This construction is borrowed directly from structural steel work, and has been used by the Aeromarine Company and others. It is cheap, and lends itself to production methods, but is apt to be heavy. A very good trussed spar can be made from these angles, by omitting the web plate. The stiffening angles are put in the form of a Warren truss, and fastened to the flanges by a gusset plate placed between the flange angles, exactly similar to ordinary bridge construction. Incidentally, the bulb angles here shown are one of the most convenient forms of extruded duralumin shapes. A surprising variety of these structural shapes has recently become available.

Practically all spars fail by lateral buckling under test conditions, unless some provision is made to prevent it. Just how far the average beam test simulates the reinforcement of the ribs and drag trussing in the actual wing is somewhat in doubt. The triangular spar shown in Fig. 9 is exceedingly stiff laterally and requires no lateral support under test. It is made of three hollow duralumin members, each consisting of a flat inner channel and a rounded outer member. The

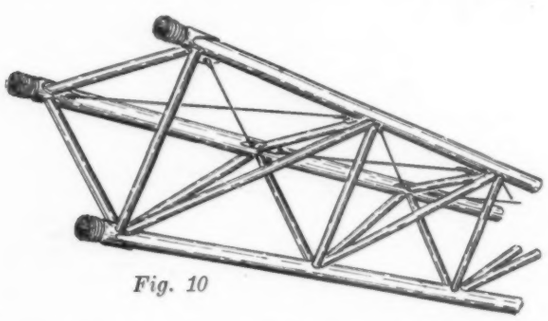


Fig. 10

three are joined together by light corrugated skin, which has been flattened on the ends and slipped between the inner channel and outer portion of the flange members. In building the beam the skin is put on the last side in narrow strips so that it is not necessary to reach far inside in backing up the rivets. This spar is best suited to a one piece cantilever wing, where the only fittings are for the fuselage attachment, and where the lateral and torsional strength of the beam is of greatest advantage.

In all deep spars a truss construction is much the most satisfactory. The obvious thought is: "Why not make a spar of welded steel tubing like a fuselage?" Such a spar is shown in Fig. 10. This is also triangular, with two members at the top to take the compression, and one at the bottom to take the tension. The side trusses are of the Warren type, and the top a Pratt truss, using cross tubes and swaged tie-rods. This particular spar was intended for a cantilever wing about 30 in. deep at the root, having detachable wing tips. The attachment fittings are shown. They consist of thick-wall threaded tubes, welded to the main tubes by a scarf weld. The actual coupling is a plain collar with left and right internal threads.

The great difficulty with all welded steel spars is that they cannot be heat-treated, and even when made of chrome-molybdenum steel are apt to be heavy, especially when shallow. To obviate this difficulty, Messrs. Kerber and Boulton at McCook Field developed the spar shown in Fig. 11. Here the flange members are made of heat-treated duralumin tubing, which is even more advantageous than heat-treated steel. The web members are of ordinary steel tubing welded to a small shield-like plate at each intersection with the flanges. These plates in turn are bolted to the flanges. The strut-attachment fitting consists of two plates bolted to the spar, forming a box, and a bushing passing through them, securely anchored to both.

In Fig. 12 is shown another tubular truss of slightly different construction. The flange members are of elliptical

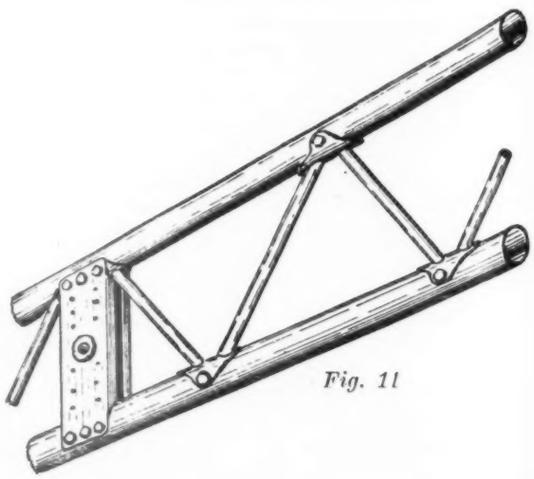


Fig. 11

heat-treated tubing, either steel or duralumin, and the webs of a continuous round steel tube, flattened when it touches the flange and bent to form a continuous Warren truss. The web truss is fastened to the flange by a vertical bolt at each joint. A bushing through the flange tube permits tightening the bolt solidly in place. In the right hand small view, the bushing is shown applied to a steel spar. The tube is drilled and the hole press-countersunk; a round steel tubular bushing is inserted; the countersunk depression is then filled with welding, and the tube is ready for heat-treat. After heat-treat and straightening, the beam is assembled. In the left hand small sketch, the bushing is applied to duralumin tubing where welding is not satisfactory. An elongated hole is cut in the flange tube, and an elliptical tubular bushing inserted, and turned at 90 deg. to the hole, so that it can not come out. A special washer is then placed over the hole having two small ears which slip through the hole and keep the bushing from turning. When the web is bolted on, all parts are held firmly in place. The construction is at once cheap and effective.

The use of elliptical tubes brings out an interesting point. It is imperative to get the center of the spar flanges as far apart as possible, for the farther apart they are the less they are loaded. Obviously, an elliptical tube has its center nearer the edge of the beam, and therefor farther from the opposite tube, than a round one. Carrying this to extremes, however, leads to another difficulty. The outside dimensions of a member should be as large as possible, in order to prevent buckling under compressive loads. That is why a tube is more efficient, though less convenient, than a flat plate, or a solid bar, or an extruded angle. The elliptical tube seems to be an excellent compromise.

Incidentally, the question is sometimes asked: "Why is duralumin tubing more efficient than steel, when both have approximately the same strength-weight ratio?" The answer is this. Since duralumin is weaker, a larger cross-sectional area of metal is required than with steel, which means that for the same wall thickness the duralumin tube will have the larger diameter. The larger member is stiffer and will take a proportionally larger compression load without buckling, and therefore becomes the lighter of the two. Thus,

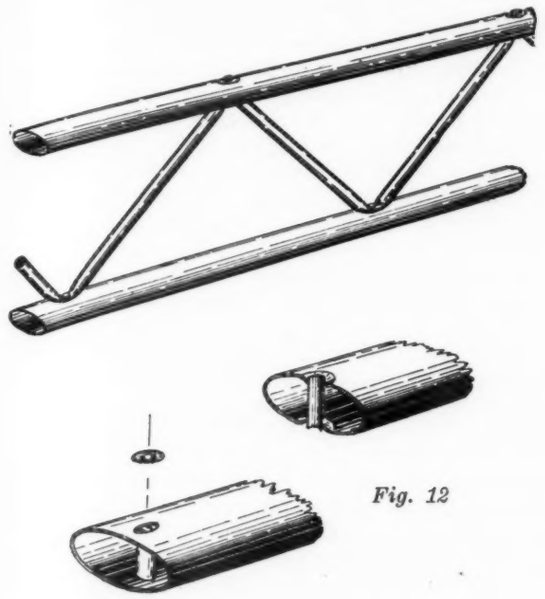


Fig. 12

duralumin has a distinct advantage over steel wherever bending or compression are concerned. Any lighter material, such as Magnesium, Bakelite, or wood, has a similar advantage over duralumin, and would replace it except for some defect in the other properties of the material.

In the beam shown in Fig. 13, Charles Ward Hall has made a very effective use of duralumin tubes. This construction is one of the lightest types known, and is of particular advantage in shallow beams, around 8 in. deep or less. The use of several tubes side by side gets the tube centers far apart, and gives the beams lateral stiffness. The web members are also tubular, flattened at the ends to take a through rivet. Intermediate rivets and spacers may or may not be provided. At the points of maximum bending, an additional tube may be added to the outside of each flange for a short distance. This type of construction, although light, embodies a large number of small parts and is apt to be expensive and not well suited to quantity production.

The spar shown in Fig. 14 was developed at McCook Field, and is novel in several respects. The flanges are made of a single sheet of duralumin, formed into an oval section and rivetted together. The web trussing consists of series of identical sheet duralumin stamped members in the form of a Warren truss. These members are of "U" section, and have their ends enlarged to accommodate several rivets. The whole assembly is simple, effective and should lend itself exceedingly well to production methods. A variation of this construction also from McCook Field, is to make the web members of duralumin tubes, flattened at the ends and rivetted between the lips of the flange members. Another variation, equally

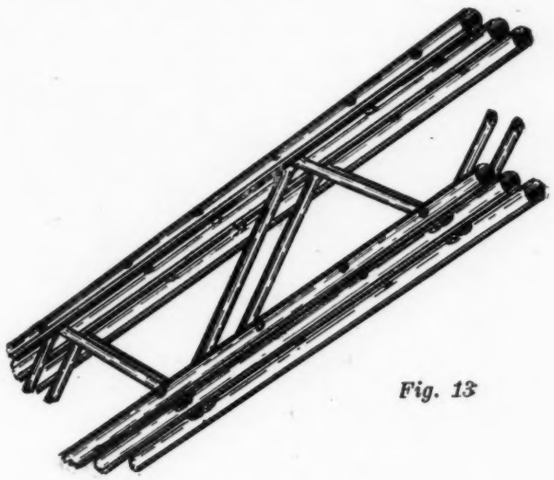


Fig. 13

good, is to join the top and bottom flanges with a flat plate, rivetted between the lips, making thus a plate girder with hollow flanges. A light vertical member at the rib attachment points serves to reinforce the web plate against buckling. This should prove a very cheap and efficient construction.

Fig. 15 shows the construction employed on the Ford-Stout monoplanes. It is a duralumin Warren truss, about 30 in. deep at the root and six inches at the tip. The flange members are of hollow "U" section, made by rivetting together an open "U" member and a shallow channel. The gusset plates are rivetted on at the same time. The web members are open channels, the verticals, which are in compression, being about two feet apart. In the upper view is shown the attachment of the inter-spar bracing. These members are also in the form of a truss, and are fastened to the spar with a "U" shaped gusset, and a cover-plate passing over or under the spar. In the bottom view the wing attachment fitting is shown. It comprises an "H" section heat-treated steel

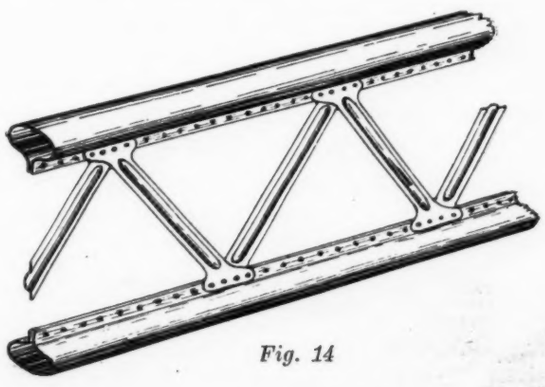


Fig. 14

drop-forging, rivetted into the end of the "U" in place of the inner channel. The whole terminal is reinforced by a heavy plate wrapped entirely around the spar, the upper extremities forming gusset plates for the web members.

The Ford-Stout construction, like the Junkers, is used with corrugated sheet duralumin covering. In both, it is necessary to rivet the covering to a hollow tubular member in final assembly, and the question naturally arises as to how the rivets are backed up. On the Ford, this is solved by the use

of a spring "dolly". The "dolly" consists of an iron casting about 6 in. long, semi-circular in section. This is placed inside the flange members, and held against the outer surface by means of springs on the flat back of the casting. The springs bear on a flat steel plate. This assembly is pulled through the flange members by a string at either end, and is brought opposite to the rivet hole. The rivet is inserted from the outside and driven by an air hammer. The inner end of the rivet bears directly against the "dolly". The repeated

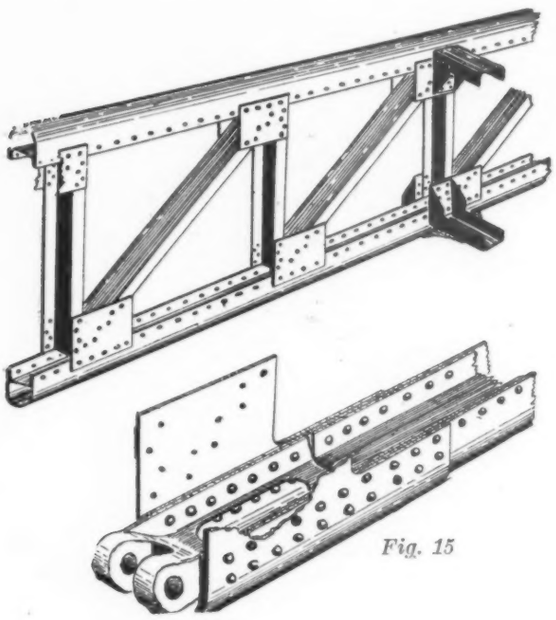


Fig. 15

hammer blows start the upper half of the "dolly" into vibration, and it pounds the inner end of the rivet until the rivet is headed up. Rivets carefully driven in this way are perfectly satisfactory, and are rapidly driven. The great objection to them is that the dolly-driven heads cannot be inspected, and the operation therefore depends on the care of the workman. The long oval hole in the wing attachment fitting Fig. 15 is for the insertion of the "dolly."

There are certain general conclusions we can draw from this and other studies, which, like all generalities, have their exceptions. Deep spars must be trusses. Medium spars may be trusses, but are preferably plate girders. Shallow spars should be single pieces, such as stampings, extruded sections or the like. The lightest construction employs thin-walled hollow members of rounded contour. In any construction duralumin will give a lighter spar than steel. Cheap production, easy inspection, and simple repair all require open sections of heavy gauge. In a word, simplicity means cheapness, but simplicity does not always mean light weight.

Finally and most important, the metal spar is essentially a quantity production affair. Its design must permit the cheap manufacture of its parts,—stamping, rolling, extrusion or whatever it may be. Particularly the design must permit rapid assembly with a minimum of hand work. This is the greatest field for development. Riveting-machines, crimpers, and semi-automatic assembly methods must be devised before we can obtain the lightness of the metal spar at a price we can afford to pay. The future of the metal spar is linked with quantity production, and with the development of this shop technique.

Not Much Difference

The change in Curtiss design is strikingly illustrated by the above photo of the old 1911 Curtiss "Pusher" and the new Curtiss A-3 "Falcon" attack plane. The A-3 is fitted with six machine guns, two of which are fitted in the bottom wings, and is now being tested by the U. S. Army Air Corps.

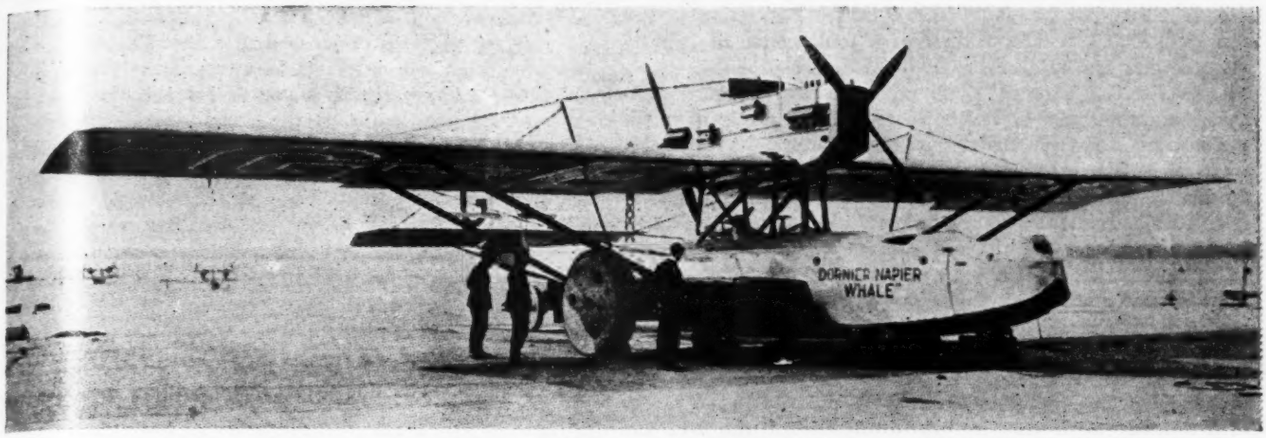
Marketing Set of Three Pliers

A SET of three pliers in a leatherette case and called the "Aviator's Kit" has been placed on the market by the Forged Steel Products Co. of Newport, Pa. The pliers in this set have been especially designed to serve the needs of those working around aircraft and aircraft engines. Each tool is forged from the highest quality tool steel which is subjected to a special through-and-through hardening and tempering process and not to ordinary surface hardening or case-hardening. By making the pliers from high grade material that is expertly treated it has been possible, by carefully designing with that end in view, to make the finished products very light in weight. This is done with no sacrifice in strength. The weight of the set of three pliers and case is only eighteen ounces. Careful design and lightness also have the advantage of making the pliers more useful. They can be used in close places where the ordinary pliers cannot be used.

One of the group is a general use plier with a long, thin nose brought to a decided point. Its chief features are hand filed cutters that cut with more ease than pliers of twice the weight, sharp teeth and deeply milled end grip, and an adjustable joint for expanding the jaws. The length of this plier is 7 inches. Another of the set, the 6½-inch "needle-nose" pattern is valuable for working in confined places. This pattern is also fitted with powerful cutters and is deeply milled at the extremity of the jaws for securing a tight hold. The handles and jaws are spring tempered. The third member of the set is a pair of diagonal cutting nippers. They measure 6 inches in length and are real cutters built for heavy duty work. All three pliers are heavily nickled over copper and have the "Vacuum Grip" handles. These handles give the user a sure grip which is important in any type of work. The case is of durable leatherette and lined with blue velvet.

Righting the Wrong

IN A letter received recently from the Gloster Aircraft Co., Ltd., London, England, our attention was called to an error which appeared on page 880 of the Oct. issue of AVIATION. In an article on the propellers fitted to the Schneider Trophy planes it was stated that the Gloster-Napier entry was equipped with a Fairey-Reed propeller of the twisted type manufactured by the Fairey Aviation Co., Ltd. The correct version is that the Gloster-Napier was fitted with a Gloster propeller of special Gloster design and construction of the forged type, and capable of fine adjustments on the ground.



The Dornier-Napier "Whale" which was forced to discard its direction finder because of Ignition Interference

Radio, Airplane *and* Engine

The Need of Cooperation Between Airplane and Engine Builders and the Radio Engineer

By LAWRENCE A. HYLAND
Radio Engineer

Article Two

TO SUCCESSFULLY operate on commercial aircraft, radio must be made an integral part of the airplane. The mission of radio can be accomplished properly only when certain essential conditions exist. The airplane builder and the engine manufacturer must, therefore, prepare their products to meet the needs of radio; while the airline operator should regard his communication equipment, not as a thing apart, but as an important unit of his service for which he in turn must make certain provision.

It may be stated at the outset that radio requires nothing not already desirable from the standpoint of safety, and that the cost of the preparation and maintenance of the aircraft for radio is so small as to be negligible.

Any radio set whether on the ground or in the air, transmitting or receiving has two external connections. The one most commonly thought of is the antenna, with which we are not immediately concerned. Of no less importance, especially for aircraft, is the much neglected "ground".

The "ground" for aircraft radio purposes consists of the metal parts of the airplane such as the engine, tanks, wires, etc. For the type of radio sets likely to be used in commercial practice for many years there cannot be too much "ground" and frequently there is too little. The effect of a small ground system is to

1. Decrease the efficiency of the radio set.
2. Increase the length of the antenna which increases air resistance and makes the antenna hard to handle and easily lost.
3. Make the radio set directional in its action. (This directional characteristic should not be confused with the desirable type used for direction finding purposes.)

To assure that the maximum "ground" will be available the airplane builder should take pains to bond properly all the metal structure of the plane.

Bonding is, at the present time, largely a matter of extremes. Manufacturers of commercial craft make little or no effort to have a good electrical connection between all major metal parts and wires. Some military jobs go to the other limit and their specifications require detached screws on a wing tip to be bonded with the frame of the ship.

Continuous Metallic Network Necessary

There is, of course, a reasonable and economical mean. Good radio bonding requires, merely, that there be electrical contact between the major parts of the metal structure of the airplane. It is not necessary to make any special provision for the connection of the wire rigging of the wings and fuselage other than to assure that the wires are interattached to metal fittings throughout so that from wing tip to wing tip and from nose to tail there is a continuous metallic network. The large conducting surfaces within the fuselage, however, deserve particular treatment. It is unsafe to place reliance on casual contact between the engine, gas tank, gas lines, and fuselage because gaskets, rubber hose and felt may give electrical isolation to considerable lengths of piping or to the tanks.

Wherever there is a fibre washer under a union, or a rubber hose connection on a gas line there should be a small flexible copper braid jumper across these doubtful joints. If the engine is mounted on a wooden frame a copper strip should be securely attached to the engine and to any metal fitting which is a part of the wire rigging of the fuselage. Each gas tank and oil tank should have one or more lugs welded or riveted to the tank from which a copper strip can be led to make secure contact with some of the metal structure of the engine or fuselage.

It should be noted in passing that correct bonding of the

tanks and gas lines is of relative minor importance for radio purposes, but is a vital factor in the prevention of fire and explosion. Wherever there is a joint, valve or vent in the gasoline system there is a possible and probable source of gasoline fumes or raw gas. It is at such danger points that the gasket, hose or felt is located which may insulate the tank or gas line from the rest of the structure. A charge of static electricity may be built up on these separated sections from any one of several causes. Nearby lightning, heavily charged cloud in the vicinity or even the normal passage of the plane through the air at a high rate of speed will cause charges of static electricity to accumulate. If the charge on the insulated section is in sufficient degree different from that on the nearby structure of the plane a spark will take place to equalize the difference in potential. It is not essential for the spark to be a yard long or a vivid flame to cause a catastrophe. An infinitesmal discharge not visible to the eye in daylight can readily set off a mixture of gas and air. Hence the necessity for thorough bonding of the tanks and gas lines.

Ignition Interference a Big Problem

On certain types of airplane construction there may be an insufficient "ground" even though the plane be well bonded throughout. For instance, an airplane with a wing construction entirely of wood is one likely to have a small "ground". Should the fuselage be entirely of metal in this case the "ground" would not necessarily be large for electrical area and not mass is the desired condition.

The remedy is to introduce a conducting network within the wing. A comparatively small amount of copper braid applied either in the interior or on the surface of the wing will make a large increase in the electrical dimensions of the craft. Needless to say the sufficiency of the "ground" cannot be guessed by a novice, but can be determined readily by a radio engineer equipped with a few instruments.

The receiving of radio signals on an aircraft is made difficult by several circumstances. Ignition interference is usually regarded as the greatest single problem with which aircraft radio engineers have to deal. But, like any other "bad boy", ignition interference is charged with many offenses to which it is not a contributor. In many cases the cause of the disturbance is vibration or flight noises which sometimes gives effects easily confused with ignition noises.

In the most lenient eyes, however, the ignition problem is a bad one. Countless devices and schemes have been proposed for the prevention of this type of disturbance. Of them all only one has proved successful and has had any considerable application. Before proceeding with the cure it may be well to examine the disease and its cause.

Greater Signal Needed for Aircraft Work

Ignition interference manifests itself as a steady series of clicks in the head telephones. Occasionally the frequency is rapid enough and the intensity of the individual clicks steady enough to produce a hum. In the usual case the listener hears a ragged, grinding noise of varying strength and of such a character as to resemble continuous summer static in a radio broadcast receiver.

The cause of all this disturbance is, of course, the engine ignition system. Each spark plug and its connecting wire is a miniature radio transmitter, emitting at every spark discharge between the points of the plug a radio wave, the principal characteristic of which is an extraordinary ability to set up disturbances in any surrounding electrical circuits.

Aircraft receivers are very sensitive instruments which take the extremely small voltages set up in the antenna by a transmitter and amplify them to hundreds of times the original value. Since the voltage induced in the receiving system is in a proportion to the distance from the sending station it will be perceived that a nearby small station can easily affect the receiver as much or more than a distant station of large power. In general, with unshielded ignition systems, at least ten times as much signal is needed for audibility in an aircraft as for good work on the ground, for the ignition system is a group of nearby small sending stations and the disturbance produced in the receiver must be overcome by more powerful signal input.

Reduction or entire elimination of ignition interference can be obtained by shielding the engine ignition system and grounding the shield at frequent intervals to the engine or to metal parts of the frame of the airplane. By shielding the ignition system is meant the covering of all of the component parts of the system such as wires, magneto, switches and plugs by a metallic surface. The field of the radio frequency disturbance is then confined to the space within this shield.

Heretofore both pilots and engine manufacturers have strenuously objected to shielding the ignition system. For the most part their arguments were well founded. To place copper braid over the ignition wires of the Liberty ignition system caused a loss of voltage which reduced an already weak spark almost to the vanishing point. Poor quality insulation was often broken down by a corona action at joints or bends in the wires, so that the spark would be short circuited and the cylinder would misfire. These defects have been overcome by the improved magnetos now available and the appearance on the market of ignition wire with more and better insulation.

At best ignition shielding as at present applied (copper braid over the ignition wires) is more or less of a patch

Receiver on Comdr. Byrd's "AMERICA". (1) Electrical noise trap. (2) Snug fitting helmet to keep out engine noise. (3) Rubber cord shock proof mounting. In addition the vacuum tubes were capped to prevent vibration noises.

work job. For that matter the ignition system of the modern airplane engine is itself vulnerable to attack from an engineering standpoint. Consider—an excellent magneto must feed its energy into a carefully designed spark plug. Both of these units have reached a high stage of perfection. The operation of the engine and the safety of the aircraft depend on the continuous flow of energy impulses from the magneto to the spark plug. But design stopped at the magneto and the plug. It has been easy and fairly effective to connect them with a wire having a little extra insulation. Consequently burned, cracked and vibrating ignition wires are frequently found on the best of our modern engines. Many of us have swung a stick for hours trying to get a wet engine started. A recent trans-Atlantic entrant, tuned to a fine edge, was discovered to have one of its ignition wires sparking through an insulation cut over to the cowling nearby.

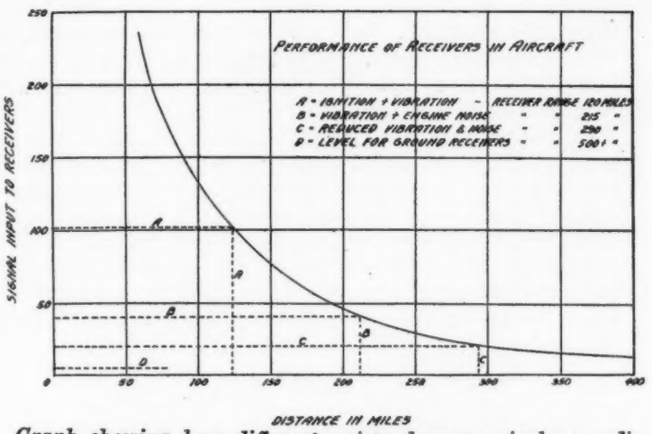
The logical solution is to enclose the ignition wires in a light metal manifold. Plugs and magnetos should likewise be covered by a metal housing. Such procedure might involve the substitution of a "colder" spark, a matter of minor importance. No other changes would be necessary. The result would be an ignition system protected against weather, hot gases and tool damage; and ideally suited to prevent interference to the radio receiver.

Shielding must be complete to be of any value. Ninety-nine per cent. is not enough. All wires in any way connected to the ignition system must be included in the manifold or separately covered and the shield grounded at frequent intervals. It is sometimes easier to have remote control of ignition by means of Bowden cables, instead of placing a shield on several wires leading to the ignition switch. This is particularly true in the case of airplanes having wing engines.

Once properly applied it is the job of the aircraft operating company to keep the shielding system intact.

Telegraph Communication Possible

Unshielded ignition systems do not prevent entirely the operation of a radio receiver aboard an aircraft. Telegraph communication can be carried on with considerable success especially on those planes where the interference is a minimum. The amount of power necessary at a ground station for communicating with airplanes is higher where unshielded aircraft are to be worked. For the worst cases the ground station must have a tremendous output in order to communicate over reasonable distances. Ignition interference should be regarded as a preventable defect in airplane communications, imposing large demands on ground station power, and unnecessarily handicapping the airplane receiver. For direction finding work the noise caused by the ignition may be the difference between success and failure. Captain Courtney who wished to make an attempt to fly the Atlantic westward this year chose a large seaplane fitted with adequate direction finding apparatus. He was delayed for weeks by the failure of his direction finder to function over long distances. The trouble was definitely known to be ignition interference. Many makeshifts were tried with no beneficial result and finally the British Marconi Company demonstrated to the satisfaction of the engine builder and Captain Courtney that comprehensive ignition shielding would make possible the desired operation of the direction finder with no adverse effect on engine operation. It was found, however, that the flying season was too far advanced to permit the necessary work in shielding the ignition. Therefore the direction finder was left off. Had the shielding been installed by the manufacturer on the engines before they were mounted on the plane the cost would have been small, the time would have been a matter of hours, and a most sensitive and accurate instrument could have been added to the plane's navigating equipment.


PERFORMANCE OF RECEIVERS IN AIRCRAFT
A - IGNITION + VIBRATION - RECEIVER RANGE 100 MILES
B - VIBRATION + ENGINE NOISE " " 225 "
C - REDUCED VIBRATION & NOISE " " 250 "
D - LEVEL FOR GROUND RECEIVERS " " 5001 "
SIGNAL INPUT TO RECEIVERS
DISTANCE IN MILES

Graph showing how different noises decrease airplane radio receiving distances. (Plotted according to Austin-Cohen transmission formula).

With the advent of radio in commercial aircraft and a growing appreciation of the advantages of protection to the ignition wires will come a demand for manifolds over the wiring. At least one prominent engine manufacturer of this country is now laying out designs for such an installation. After its successful demonstration others will fall in line.

The manufacturer would do well to call into consultation an experienced aircraft radio engineer before attempting to revamp his ignition system. Both airplanes and engines have peculiarities which may operate to the benefit of the builder. Needless expense may be avoided by the adoption of the correct method to fit the individual case, for the vagaries of ignition systems are as wide as the field of radio.

Not the least important of the noise makers which hinder airplane reception is vibration. Vibration noises are very similar to those caused by the ignition system. It is sometimes difficult for an experienced observer to distinguish between the two. In nearly all cases the effects of vibration can be disposed of by bongee suspension or other shockproof mounting of the receiver. Some extreme cases where the elements of the vacuum tubes are set in motion by strong sound waves it is usual to put a soundproof cap over the vacuum tube. Better engine balance and cabin type planes are fast reducing the vibration problem and little trouble is predicted from this source in the future.

Leather Sheathing a Help

A little known cause of noise is in the aileron and stabilizer control wires. These wires may pick a charge of static electricity from their passage through the air and release the charge by coming in contact through vibration or otherwise. Especially is this the case where there are long outside controls which run through well greased metal pulleys or fibre sheaves. At the instant of the discharge or equalization of the static accumulation a noise is produced in the telephones which may resemble ignition noise. A little thought in the layout of the controls and some leather sheathing at important points will entirely eradicate this evil.

The noises incident to flight—motor exhaust, propeller slap, etc.—occasion some little difficulty in receiving. Here again the cabin type airplane and partially muffled exhaust serve to decrease materially the effect of these external noises. The future demands of passengers will be the assurance that trouble from flight noises will become progressively less.

The sum total of the electrical, vibration and flight noises makes quite a bedlam through which the aircraft radio operator must pull out his messages. Very careful design is

needed in the receiver in order that the effects may be reduced to a minimum. It is obvious that radio equipment to work under such conditions should not be of hit or miss origin with little thought given to certain basic features which have proved of value after years of tests.

Fortunately, the receiving of radio signals on an aircraft is not entirely without advantage. The antenna and ground arrangement is probably far more effective than at any ground station. There are no absorbing mediums such as trees, buildings, etc. The antenna has maximum signal pickup. This excellent efficiency keeps the noise to signal ratio within the bounds of operation. It must be stressed, however, that to retain the advantage of the effective airplane antenna system the receiver must be of correct design.

Static Not a Problem

A second happy circumstance is that "static" or atmospheric disturbance of an electrical nature is not a problem. The high noise level on an airplane which necessitates a very loud signal for audibility prevents normal static from being heard. Only in the event of a severe thunderstorm in the immediate vicinity is it possible to hear crashes of static. These bursts are of limited duration and do not interfere seriously with signals. Thunderstorms are usually small in extent and the interference from any one will be for a very short period. At no time is the intensity of the static noise so severe as to entirely prevent operation of the radio receiver on the plane. In several years of working with radio on aircraft during hundreds of flights the author has been hampered once by static. At that time the airplane was flying through an exceptionally severe tropical thunderstorm. This interference lasted for about twenty minutes and was caused by a continual spray of lightning flashes close to the route travelled by the plane.

So, the cooperation of airplane and engine builders with the radio engineer can greatly improve radio operation on an aircraft, and at the same time make the craft more safe and reliable. Further, the airplane has special advantages for radio work. High performance must be built into the radio equipment not only for economy in space and weight but also to retain the favorable conditions which make possible good radio work despite adverse noises.

A third article by Mr. Hyland will appear in an early issue of AVIATION.

Pitcairn "Mailwings" for C.A.T.

COLONIAL AIR Transport, Inc., operating the air route between New York and Boston has just added to its equipment two Pitcairn "Mailwings". These planes are of the open cockpit type, with closed compartments for mail and express, and powered with Wright J-5-C engines, have a top speed of 135 m.p.h., a cruising speed at 1650 r.p.m. of 105 m.p.h. and a landing speed of between 42 and 45 m.p.h. They are considered ideal for winter night operation over tthe Boston-New York route. They are equipped with every device for safe night flying.

Texas Air-King Co. Formed

THE TEXAS Air-King Co. has been formed to act as general distributing agents for Air-King airplanes manufactured by National Airways System, Lomax, Ill. A. D. Niemeyer, chief test pilot for the Texas company is a well known and popular flier from the Lone Star state. He announces the plans of his company include the sale of Air-Kings for the entire state of Texas. Headquarters will be established at Love Field, Dallas, Texas.

Clubs Form Aviation Committee

AT AN organization meeting, with thirty present, held recently in Pittsburgh, Pa., of the Aviation Committees representing the ten leading luncheon clubs of that city, the following officers of the "Joint Luncheon Clubs Aviation Committee", were elected by the members present:—Chairman, William B. Rodgers, Kiwanis Club; Vice Chr., R. S. McCarty, Kiwanis Club; Secretary, Ray A. Tucker, Aero Club.

The Executive Committee is composed of one member representing each of the ten clubs, as follows: John J. Feery, Aero Club; Samuel Harper, American Business Club; Robert A. Laedlein, City Post No. 59, American Legion; Frank M. Leavitt, Co-Operative Club; A. G. Trimble, Kiwanis Club; J. A. Phillips, Lions Club; C. Verne Shoup, Mercator Club; Guy M. Williamson, Monarch Club; R. A. McGregor, Optimist Club, and Thomas A. Dunn, Rotary Club.

This organization has been formulated to assist in surveying Allegheny County for possible sites for a new large municipal airport for Pittsburgh, and to stimulate and create interest in the membership of each club towards this end. The results of the surveys will be turned over to the recently appointed Airport Committee of the Chamber of Commerce, headed by Arthur E. Braun, president, Farmers Deposit National Bank. The county will be divided up into ten districts and each Luncheon Club will be assigned a district to survey.

For the Passengers

The above are photographic reproductions of the Florentine leather ticket holders that are presented to all passengers who fly on the Italian S.A.N.A. airline that is operating Dornier Wal seaplanes between Genoa, Rome, Naples and Palermo. The wallet on the left is for men passengers and may be used as a bill folder when the ticket has been used. The pocket book on the right for ladies is of hand tooled leather and makes an attractive souvenir of the aerial journey.

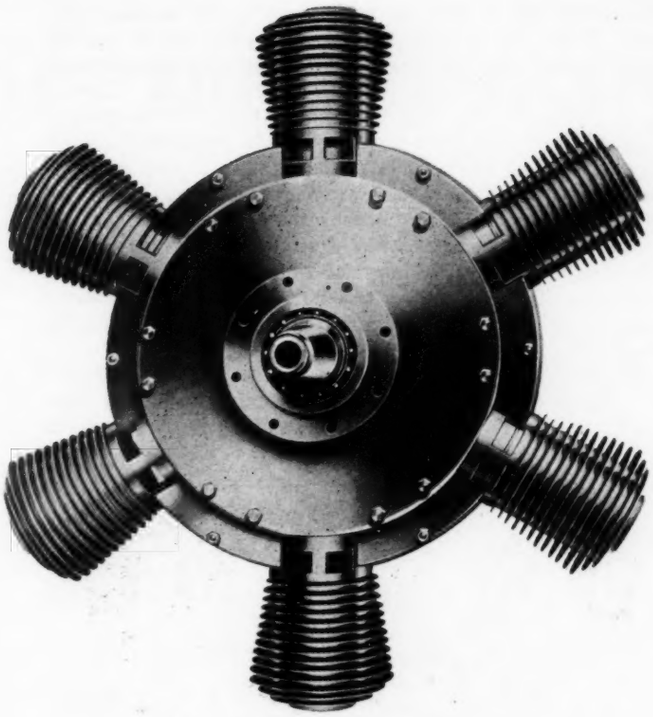
New Waco Distributor Appointed

THE ADVANCE Aircraft Co., of Troy, O., announces that it has appointed The Northern Airways, Inc., of Wausau, Wis., as Wisconsin and Minnesota distributor. John P. Wood, president of The Northern Airways, Inc., is a nationally known pilot of many years standing.

The company also states that a complete sales and service organization, field, hangars, etc., are now available at Wausau for all Waco dealers, owners, and visiting pilots. The Northern Airways, Inc. contract is for well over a hundred planes for delivery throughout the balance of 1927 and the first six months of 1928.

The "Ajax" and "Atlas" Engines

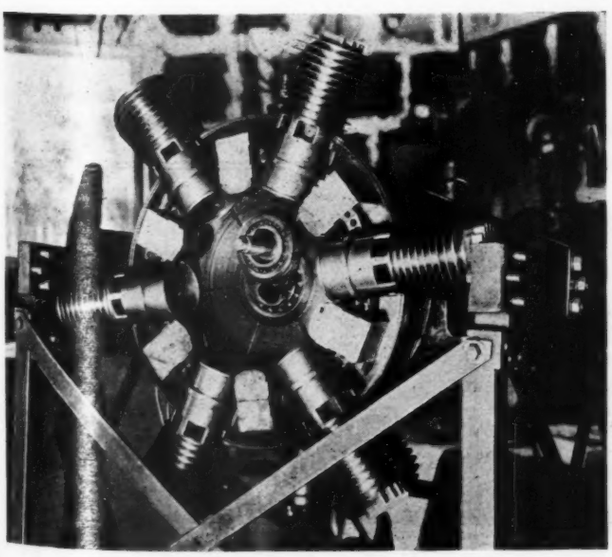
Two Cycle Engines Developing 80 and 120 Horsepower



The "Ajax" 80 hp. engine.

THE AIRCRAFT Holding Corp. of Los Angeles, Calif., recently completed a number of engine tests and has announced production on two cycle, air cooled, radial aircraft engines. The engines, which are supercharged, are to be produced in two sizes, the "Atlas" of eight cylinders developing 120 hp. and weighing 260 lb. and the "Ajax" with six cylinders developing 80 hp. The Ajax is still in the course of production having been developed from the larger sized engine.

The manufacturer states that these two sizes were developed after a canvass of many operators and manufacturers who expressed the need for a moderate priced power plant for a low powered light plane. Before construction was started on the 120 hp. size the feasibility of a two cycle, two stroke engine equipped with a supercharger was doubtful, so for development purposes two 25 hp. engines were built. The supercharger was built with two large gears and operated as a separate accessory to the engine. This gear type supercharger was replaced by a four vane eccentric rotary supercharger built into the next experimental model as part of the engine. This was an engine of 70 hp. which later led to the design of a still further improved model of 30 hp. The 70 hp. engine was later used to determine the effects of various new features and changes before incorporating them in the design of the "Atlas" 120 hp. engine.



Showing the anti backfire boxes of the 80 hp. "Ajax" engine. The boxes are of light aluminum and filled with small tubes.

The 120 hp. Atlas engine has eight radial cylinders, and complete with its x supercharger, weighs 260 lb. A second engine to be known as the "Ajax" developing 80 hp. is now being developed. As the Atlas engine operates on the two stroke cycle there are eight power strokes per revolution. There is a power stroke every time a piston rises to the head of the cylinder and thus there are eight power strokes per revolution or the number obtained in one revolution of a 16 cylinder four cycle engine.

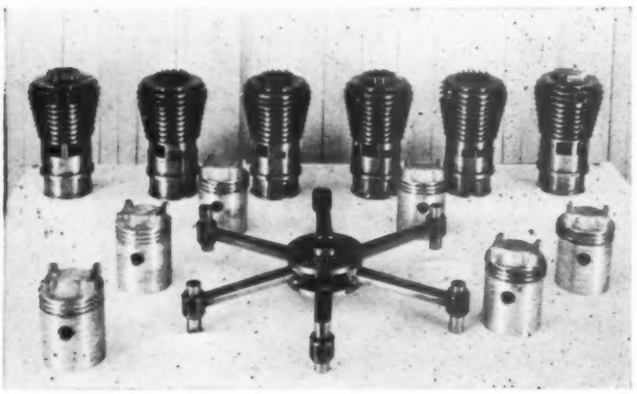
Starvation Characteristic Eliminated

The cylinders are of alloy steel forgings turned from the solid with head and fins integral. The exhaust ports are extra large being placed at the bottom of the stroke on diametrically opposite sides of the cylinder. By having two deflectors on the piston head the exhaust gases are prevented from mixing with the intake charge. The incoming gases are well distributed by entering the cylinder at the bottom of the stroke on diametrically opposite sides under pressure. It is claimed that the double system of intake and exhaust creates a high turbulence effect with consequently better flame propagation during the explosion. It is also said to eliminate the "starvation characteristics" of previous two stroke engines with only one intake position and one deflector which usually left the opposite side of the cylinder with a pocket of inert burned gas.

The engine has a small overall diameter due to the absence of valves and valve mechanism. The two stroke engine has

less moving parts than the four stroke engine so commonly used. There are no cams and the only gear used is the one which operates the accessory drives. The supercharger is of the positive pressure type running at engine speed. The rotor is driven directly from the crankshaft and the mixture is supplied to the crankcase under a variable pressure. The pressure varies from 1.5 to 10 lb. per sq. in. This is very useful to compensate for changes in atmospheric pressure or loss of power at altitude. It is stated by the manufacturer that the engine builds up pressure even at starting speeds rather than requiring a considerable lapse of time to build up pressure as in some of the high speed turbine types. The supercharger sucks the mixture from the carburetor and forces it into the crankcase.

A force feed lubrication system is used; the oil is forced by a triple outlet pump, one outlet forcing oil to the main and connecting rod bearings, another to a spray in the crankcase and the third to the supercharger. This last causes the incoming mixture to be saturated with oil before entering the cylinders. This eliminates the practice of mixing oil with the gasoline, as in some two cycle engines, and thus fill up the jets of the carburetor.



A layout display of the principal working parts of the 80 hp. "Ajax" engine.

The specifications of the Atlas engine as stated by the manufacturer are as follows:

Bore	4⅞ in.
Effective stroke	4¾ in.
Full stroke	6 in.
Compression ratio	5.2 to 1
Horsepower	120 hp. at 1250 r.p.m.
Fuel consumption	.52 pints per hp. hr.

Test Landing Made on East River

PROVING THE feasibility of using the East River, New York City, as an airport, Assistant Secretary of War, Hanford MacNider, landed recently in a Loening Amphibian at the dock at the foot of 31st St. and East River. Mr. MacNider was piloted from Washington to Mitchel Field by Capt. Ira Eaker, in 1 hr., 45 min., and the amphibian then took off the land field and was flown to the East River in 18 min., thus saving almost an hour over the time that it would have taken to drive in, or take a train from Mitchel Field into the heart of New York City.

Despite gusty wind conditions and adverse tides, there was no difficulty in bringing the amphibian to an easy mooring at the Loening dock. The East River has been recommended for an airport site for amphibians and seaplanes, and Assistant Secretary MacNider is the first government official to test out the practicability of this convenient location.

Close Contract for 75 Wacos

THE ADVANCE Aircraft Co., of Troy, O., reports that it has closed a 75 plane contract with E. M. Ronne, Buffalo Airport, Buffalo, N. Y., covering the western section of New York state and the northern boundary counties of the state of Pennsylvania. Mr. Ronne will take planes throughout the winter months for sale and storage and his spring delivery schedule is heavy.

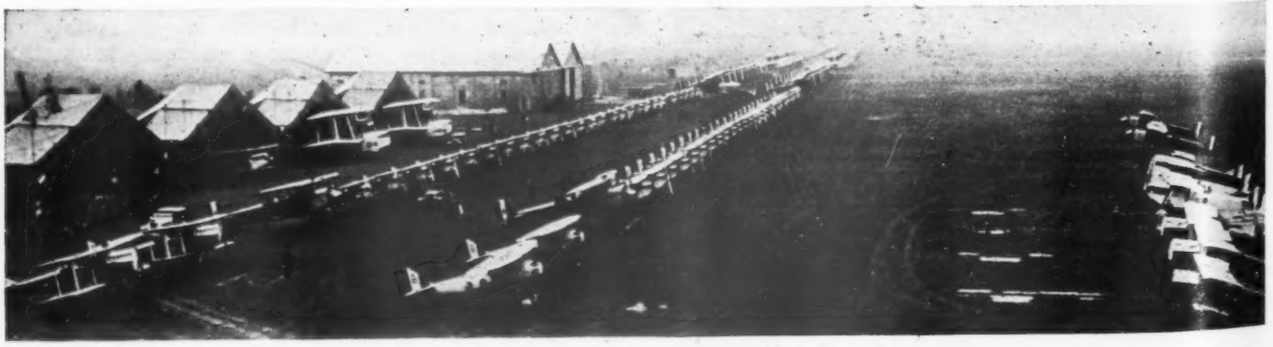
All Waco distributors are well able to take care of all planes the company can produce throughout the winter months and early spring. The Advance Aircraft Co. also states that it will continue its five per day schedule and increase it as fast as possible.

Warning to Airmen

WORD HAS been received from the Standard Oil Company of California that at various places in southern California and the San Joaquin Valley there have lately been installed systems of lightning protection over oil reservoirs, consisting of numerous rods as high as 125 ft. These are very slender and when visibility is poor are difficult to see. Therefore caution should be observed when flying in the vicinity of oil reservoirs.

Caution should be observed, especially in landing at Bakersfield, California, field. There are 48 lightning rods immediately north of the airport and 39 others on a reservoir area one mile to the northeast.

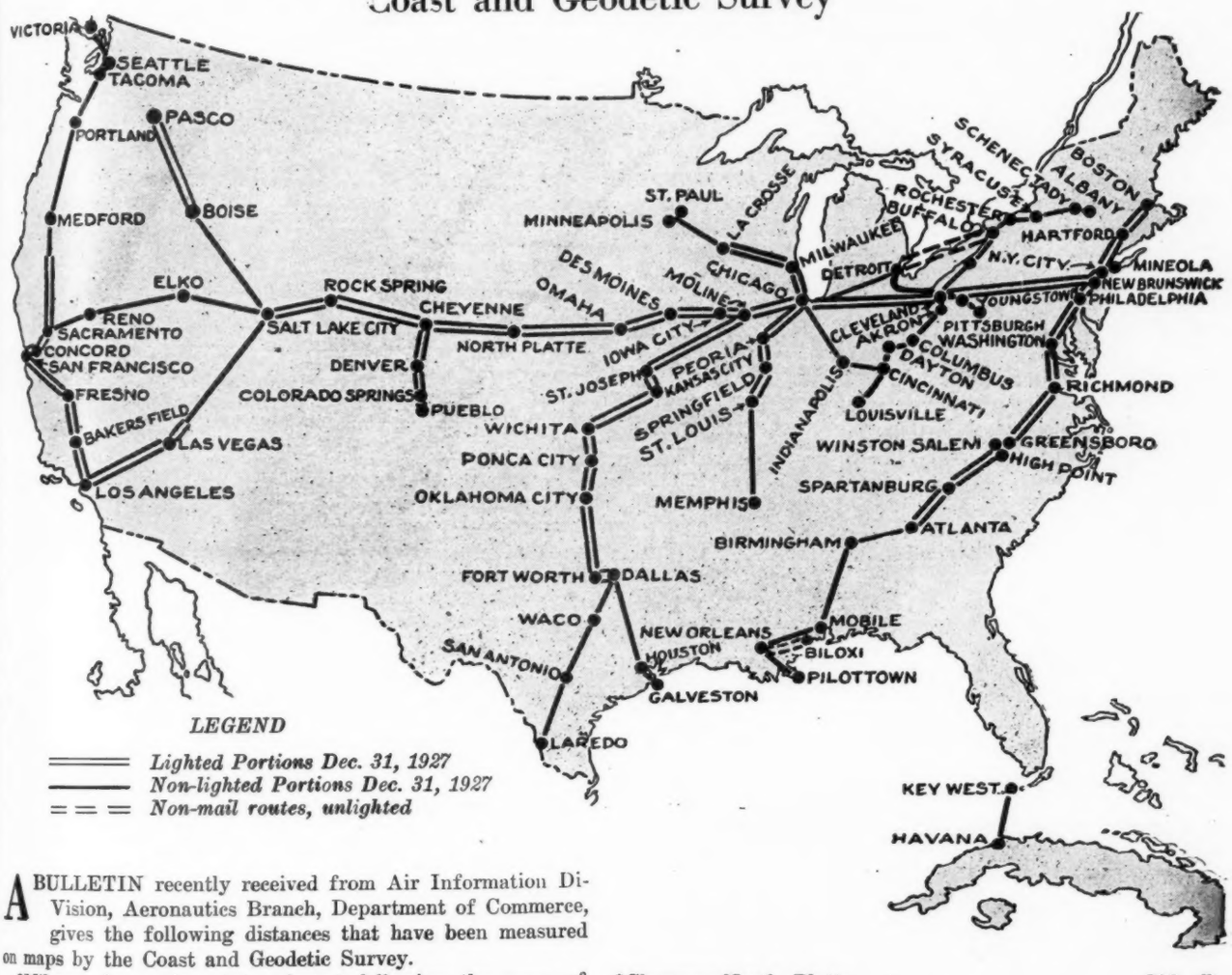
On Parade for Royalty



A line up of 500 planes at Province of Udine, Italy, that were inspected by His Majesty King Victor Emmanual III, Italo Balbo, under-secretary for aviation, and General Armani, minister of aviation, prior to a series of aerial maneuvers executed in their honor.

Mileage Statistics *on* Airways

Bulletin Gives Map Measurements by Coast and Geodetic Survey



A BULLETIN recently received from Air Information Division, Aeronautics Branch, Department of Commerce, gives the following distances that have been measured on maps by the Coast and Geodetic Survey.

*Mileage from airport to airport following the mean of the airway as surveyed for day and night flying.

**Mileage from airport to airport following the airways as surveyed for day flying.

***Air line mileage between airports.

All other distances are air line, center to center of cities or in the case of a route, the mileage may be the combination of the above. All distances are subject to change as air navigation facilities are installed.

*Chicago (Cicero)-New York	712	mi.
*Chicago (Cicero)-Cleveland	318	"
*Cleveland-Bellefonte	220	"
*Bellefonte-Hadley Field	174	"
**San Francisco-Chicago (Cicero)	1,949	mi.
**San Francisco-Sacramento	88	"
**Sacramento-Reno	102	"
**Reno-Elko	232	"
**Elko-Salt Lake City	199	"
*Salt Lake-Rock Springs	168	"
*Rock Springs-Cheyenne	253	"
*Cheyenne-North Platte	216	"
*North Platte-Omaha	261	"
*Omaha-Des Moines	129	"
*Des Moines-Iowa City	103	"
*Iowa City-Chicago (Cicero)	198	"
*New York-Boston	219	mi.
*Hadley Field-Hartford	124	"
*Hartford-Boston	95	"
*St. Louis-Chicago (Cicero)	268	mi.
*St. Louis-Springfield	81	"
*Springfield-Peoria	65	"
*Peoria-Chicago (Cicero)	122	"
*Dallas-Chicago	905	mi.
*Dallas-Fort Worth	30	"
*Ft. Worth-Oklahoma City	180	"
*Oklahoma City-Ponca City	89	"
*Ponca City-Wichita	69	"
*Wichita-Kansas City	173	"

*Kansas City-St. Joseph	48	"
*St. Joseph-Moline	256	"
*Moline-Chicago (Cicero)	150	"
Los Angeles-Salt Lake City	633	mi.
*Los Angeles-Las Vegas	265	"
Las Vegas-Salt Lake City	368	"
Salt Lake City-Pasco	540	mi.
**Salt Lake City-Boise	300	"
*Boise-Pasco	240	"
Detroit-Cleveland (around Lake)	155	mi.
Detroit-Chicago	252	"
Los Angeles-Seattle	1080	mi.
*Los Angeles-Bakersfield	111	"
*Bakersfield-Fresno	110	"
*Fresno-San Francisco	157	"
**San Francisco-Medford	316	"
**Medford-Portland	233	"
**Portland-Tacoma	122	"
**Tacoma-Seattle	31	"
Seattle-Victoria	77	mi.
Chicago-St. Paul/Minneapolis	399	mi.
Chicago-St. Paul/Minneapolis via. Watertown, Madison & Portage	426	mi.
*Chicago-Milwaukee	81	"
*Milwaukee-La Crosse	193	"
*Milwaukee-La Crosse via Watertown, Madison & Portage	220	"
**La Crosse-St. Paul/Minneapolis	121	"
Cleveland-Pittsburgh	121	mi.
Cleveland-Youngstown	62	"
Youngstown-Pittsburgh	59	"
*Pueblo-Cheyenne	200	mi.
*Pueblo-Colorado Springs	39	"
*Colorado Springs-Denver	66	"
*Denver-Cheyenne	95	"
Pilottown-New Orleans	75	mi.
Louisville-Cleveland	345	mi.
Louisville-Cincinnati	89	"
Cincinnati-Dayton	48	"
Dayton-Columbus	65	"
Columbus-Akron	112	"
Akron-Cleveland	31	"
*Atlanta-New York	763	mi.
*Atlanta-Spartanburg	167	"
*Spartanburg-Winston-Salem Greensboro/High Point	140	"
*Winston-Salem/Greensboro/ High Point-Richmond	177	"
*Richmond-Washington	98	"
*Washington-Philadelphia	120	"
*Philadelphia-Hadley Field	61	"
Cleveland-Albany	446	mi.
Cleveland-Erie	95	"
Erie-Buffalo	82	"
Buffalo-Rochester	66	"
Rochester-Syracuse	74	"
Syracuse-Schenectady	114	"
Schenectady-Albany	15	"
Atlanta-Miami	622	mi.
Atlanta-Jacksonville	287	"
Jacksonville-Miami	335	"

Try This One

The art and science of flagpole sitting rose to new heights when Alvin "Shipwreck" Kelly recently demonstrated at Curtiss Field, L. I., a refinement by successfully sitting on a flagpole on a plane 500 ft. in the air. Rigged up in the center of the top wing of a plane piloted by M. M. Merrill, was a ten foot iron pole with a one foot cross bar near the top. Kelly perched on the cross bar as is shown in the above picture.

Salt Lake City-Great Falls, Mont.	489	mi.
Salt Lake-Pocatello, Idaho	147	"
Pocatello-Butte, Mont.	225	"
Butte-Helena, Mont.	44	"
Helena-Great Falls	73	"
New Orleans-Atlanta	483	mi.
New Orleans-Mobile	132	"
Mobile-Birmingham	213	"
Birmingham-Atlanta	138	"
Los Angeles-San Antonio	1289	mi.
Los Angeles-San Diego	115	"
San Diego-Yuma	151	"
Yuma-Maricopa-Tucson	239	"
Tucson-Lordsburg	131	"
Lordsburg-El Paso	137	"
El Paso-Marfa	176	"
Marfa-Dryden	113	"
Dryden-Fort Clark	115	"
Fort Clark-San Antonio	110	"
Laredo-Dallas	395	mi.
Laredo-San Antonio	142	"
San Antonio-Waco	168	"
Waco-Dallas	85	"

Galveston-Dallas	267 mi.
Galveston-Houston	48 "
Houston-Dallas	219 "
Atlanta-St. Louis	472 mi.
Atlanta-Nashville	220 "
Nashville-St. Louis	252 "
Detroit-Buffalo	218 mi.
Memphis-Birmingham	218 mi.
Birmingham-Nashville	185 "
Dallas-Muskogee	215 "
Muskogee-Kansas City	228 "
Kansas City-St. Louis	244 "
Belleville-Rantoul	151 "
**Rantoul-Kokomo	106 "
**Kokomo-Mt. Clemens	227 "
Dayton-Detroit (Ford Airport)	183 "
Indianapolis-Chicago	165 "
Cincinnati-Indianapolis	102 "
Minneapolis, St. Paul-Fargo	220 "
Fargo-Winnipeg	207 "
Grand Rapids-Milwaukee (across Lake)	144 "
Grand Rapids-Detroit	140 "
Havana-Key West	104 "
Miami-Key West	128 "

Army Exhibitions Limited

ACCORDING TO a report from the War Department instructions have been issued to all corps area commanders that requests for the participation of Army aircraft in celebrations and demonstrations will be disapproved, except those made in connection with the dedication of airports and landing fields or features having a military significance. This policy was made necessary on account of the increasing number of requests for Army aircraft to participate in fairs, exhibitions, and similar events. It has been found impossible to grant all such requests without serious interference with military training programs. Therefore, to avoid any favoritism, it will be the policy to deny all such participation by the Air Corps.

Exception was made in the case of the establishment of airports, as the War Department desires to encourage such activities throughout the country. The corps area commanders are, therefore, directed to give all assistance possible in the dedication of airports within their respective corps areas.

French-S. A. Airline Planned

A RECENT report from France states that finance committee of the French Chamber of Deputies has voted 120,000,000 francs (about $4,800,000) as a subvention to the Latecoere Co. which for some time has operated an air line between France and her African colonies.

After the recent successful flight of Dieudonné Costes and Joseph Le Brix from Paris to Buenos Aires in six hops, this company obtained a contract with the Argentine Government for handling transatlantic air mail.

The Chilean Government also contracted for a combination air mail service with the posts delivered to Chile from Argentina by rail. The company has been seeking other contracts with other South American countries.

The subvention voted is effective for 1928. It is expected that if the experiment meets with any sort of success, sufficient funds to keep it going in the future will be forthcoming.

Activities and Plans of Atlantic, Gulf and Caribbean Airlines, Inc.

RICHARD F. Hoyt, of the banking house of Hayden, Stone & Co., New York City, in a recent interview with a representative of AVIATION, described the present activities and outlined some of the plans of the Atlantic, Gulf and Caribbean Airlines, Inc. Mr. Hoyt has been actively interested in the formation of this new air transport company which is a Delaware corporation and was formed to operate airlines in the southern part of the United States and eventually extend operations to the West Indies, Central and South America.

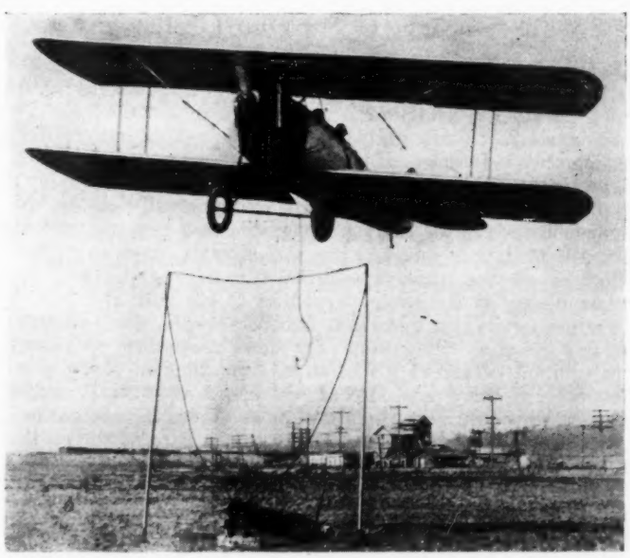
Owns Pan-American Airways

At the present time the Atlantic, Gulf and Caribbean Airlines is operating, through the Pan American Airways, the route from Key West, Fla. to Havanna, Cuba. The latter line is owned entirely by Atlantic, Gulf and Caribbean.

When it came to financing Pan American it was found that several groups were interested and further, that a complicated capital structure had been set up, so it was decided that the simple way would be to finance through the Atlantic, Gulf and Caribbean. This was done and all interested groups are in the Atlantic, Gulf and Caribbean which owns the Pan American.

Fokker Tri-Motors are being used on the Pan-American line. Two are now in operation and a third will be delivered later to be used as a reserve plane. Extension of operations will depend upon the establishment of additional mail routes. When it becomes possible to obtain these mail contracts, it is hoped that an air transport system carrying passengers and express in addition to mail may link the United States with the West Indies, Central and South America.

On the Fly



Blaine M. Tuxhern, a Kansas City aviator, has invented a device which will enable a plane going 100 m.p.h. to pick up parcels from the ground with the aid of a cannon. A hook attached to the landing gear of the plane catches to a wire suspended in the air making an electrical contact firing the cannon and shooting the parcel along side the plane. Picture shows the plane about to pick up 50 lb. of sand in a container in the cannon.

Navigating *the* Ship *of the* Air

Comparisons in the Art of Navigating Trans-Oceanic Aircraft and Surface Vessels

By LIEUT. E. A. HOSMER, U.S.N.R.

Formerly Assistant Sup't of Radio, U. S. Air Mail

INTEREST IN the age old art of navigation has been revived, brought to life by the recent trans-oceanic flights, Many capable pilots who had scarcely heard of a sextant and similar appurtenances of the navigators art are becoming interested in great circle courses, Mercator charts etc.

The problems involved in navigating trans-oceanic aircraft are fundamentally the same as those involved in navigating a surface vessel. The object is the same i.e., to take departure from a certain point, know at all times the exact location of the ship and to arrive at any given point by the most direct route. To be able to obtain a "fix" at any time, that is to fix ones position on the surface of the earth, at any time, regardless of weather conditions calls for skill of the highest order. The surface navigators inability to obtain an exact fix at any moment may not necessarily be of serious consequence but, to the aircraft navigator, inability to do so is apt to mean almost certain disaster. The aircrafts more limited cruising range makes it impossible to long defer the arrival. Furthermore, should the weather be obscure, the aircraft navigator, as in Byrd's case, may find his destination inaccessible, even though he knows he is within a very short distance of it.

New Type of Navigator Likely

While their fundamental objective is the same, the aircraft navigator is confronted with many serious problems with which the surface navigator is not concerned, and the methods used in solving those problems common to both may differ considerably. Because of these differences, a new type of navigator is likely to be the result of trans-oceanic flying. In place of the vast amount of knowledge usually classed as seamanship, which the surface navigator must have and which obviously will be valueless to the aircraft navigator, the sailorman of the airways will be versed in radio and in certain phases of meteorology peculiar to his calling.

Surface navigation is divided into two classes, dead reckoning and celestial navigation. By dead reckoning we mean a calculation of the ship's position from time to time by a knowledge of the course steered and speed maintained, making due allowance for winds and tide. Celestial navigation is the art of fixing one's position on the surface of the earth by the observation of certain heavenly bodies. Heavenly bodies which have hung in the sky for thousands of years, just as they will hang tonight and for thousands of years to come, have been observed by scientists and the data regarding their movements has been recorded and made available for the use of the mariner and forms the basis of celestial navigation.

Mariners make use of both dead reckoning and celestial navigation, using one to check the other and so are able to tell at any instant just what the ship's position is, the distance made good and the distance from the point of destination.

The surface navigators days work varies from time to time according to weather and other conditions, but the following outline will serve as an example:

Take morning sight of the sun for longitude.

Take morning azmuth of the sun for the purpose of checking the compass deviation.

Take ex-meridian and meridian altitude of the sun for latitude.

Take afternoon sight of the sun for longitude.

Obtain evening twilight "fix" by star sight.

Obtain morning twilight "fix" by star sight.

Calculate position by dead reckoning and calculate distance made good during past twenty-four hours.

Calculate set and drift of the current.

Maintain constant check on course steered, speed, etc.

In obscure weather, when celestial observations are impossible, the surface navigator depends entirely on dead reckoning. Years of experience has made the mariner adept in checking his position by this means, but in general dead reckoning is not considered so accurate as celestial navigation.

In the recent trans-Atlantic flights, Lindbergh and Chamberlin depended on dead reckoning to guide them to their destination. Byrd's party although exceptionally well equipped from a navigational standpoint, encountered such adverse weather that observations were impossible and he too was forced to depend on dead reckoning. The trans-Pacific flights however presented a different problem. It is one thing to take departure from the east coast of North America, fly or sail a pre-determined course and anticipate arriving "Somewhere in Europe" and quite another to take departure from the west coast and expect to arrive safely at so small a point in the Pacific Ocean as the Hawaiian Islands. The carrying of a proficient navigator was absolutely necessary to the success of the trans-Pacific flights. This fact was recognized by the officials handling the Dole race and each navigator was required to pass a rigid government examination prior to the qualifying of his plane.

First Voyage as Air Navigators

The Army's trans-Pacific plane was efficiently handled by two thoroughly trained technicians, two of the first of our new aircraft navigators. Smith's City of Oakland was navigated by a capable mariner, a veteran of many years service in our Merchant Marine. Other trans-Pacific fliers carried naval officers, merchant marine officers and yachtsmen as navigators. All were capable navigators, for the most part seafaring men of the old school, but as aircraft navigators, many of them were making their first voyage.

Reference to the paragraph, outlining the surface navigators day's-work, will indicate that the day's-work of the aircraft navigator must necessarily be quite different. It may not be a serious matter for the slow moving vessel to wander off course for several hours between sights, but because of the tremendous speed at which aircraft travel, four or five observations per day will not suffice for its guidance.

It is not always possible to take more observations, in fact it is frequently impossible to take more than one sight in twenty-four hours. Now then shall we navigate our trans-oceanic aircraft? What shall be the special training of the aircraft navigator? These are the two most important problems confronting those interested in trans-oceanic aviation.

Airways over which aircraft will be guided by radio beacons are a logical development and to a great extent will solve the first problem. The use of the radio beacon system will do much to assist the aircraft navigator, but it will not eliminate him from aircraft any more than the use of the radio compass has eliminated him from surface vessels. The increased use of radio beacons will make a knowledge of radio communication necessary for all aircraft navigators, for in addition to the desirability of reducing the crew by eliminating a radio operator, there is a distinct advantage in having one man handle all phases of the aircrafts navigation.

Only a few of our charts and navigation tables are adapted to aircraft navigation and meteorological data of the trans-oceanic airways is as yet so meager that the aircraft navigator's task is a difficult one. Scientists are correcting these conditions and all data necessary for trans-oceanic flights should soon be available.

Fog the Greatest Enemy

There is another important phase of navigation not yet discussed in these paragraphs and which is usually referred to by mariners as piloting. As a ship approaches the coast, particularly in the vicinity of important harbors, bell and whistle bouys, channel bouys and lighthouses assist the navigator in bringing his ship to a safe anchorage. The exact depth of the water, formation of the ocean bottom, etc., are accurately recorded on the charts and can be checked by soundings so that even though the weather be obscured, the mariner is able to feel his way safely into the harbor.

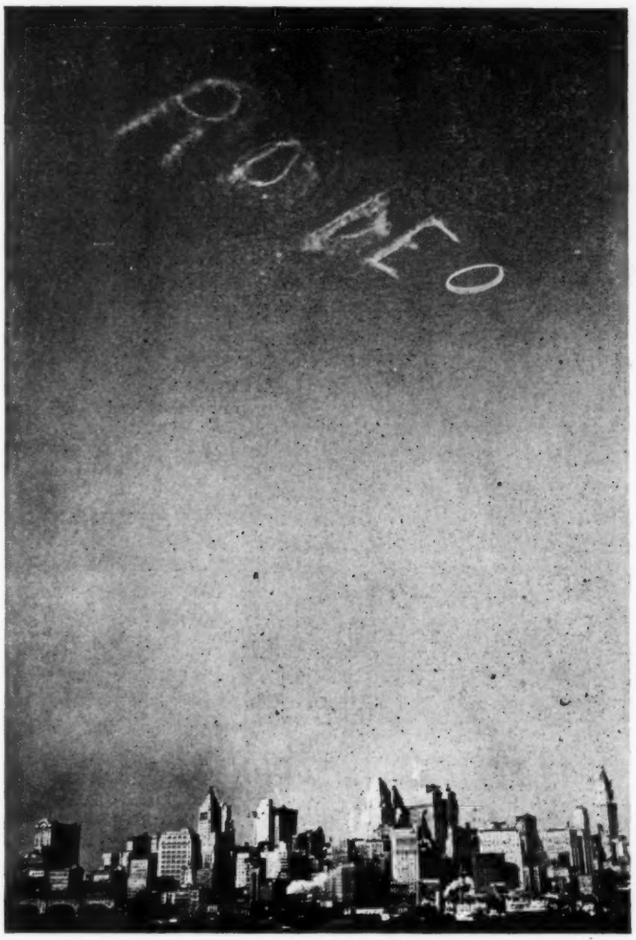
In aircraft navigation, we have not yet reached the stage of development where a similar safe arrival is possible under all conditions. One might be a capable navigator, as in the case of Byrd and plot a true course for hundreds of miles, only to meet defeat in the end because of the inability to make a safe landing on an obscured landing field. Fog, the greatest enemy of the sea-faring man looms today as the greatest enemy of the newer wayfarer, the aircraft navigator. No light so far invented by man is capable of penetrating fog to any appreciable distance. In surface navigation, the use of audible signals and soundings has served to overcome this condition to a certain extent, but obviously these methods are not available for the aircraft navigator. The aircraft navigator may follow the radio beacon right up to his destination, but due to the fact that no radio signal has yet been devised which will indicate a spot only a few hundred feet wide, he may then be unable to tell just where to land.

We may expect further development of the radio beacon system, and science may evolve a plane which will settle gently down in a vertical direction. We may expect improved engines and greater cruising ranges, but the efficient operation of the craft will then be largely dependent upon the training and skill of its navigator.

Start Work on Canadian Airport

WORK HAS been started on the construction of the new airport at St. Hubert near Montreal, Can., according to a report sent by Trade Commissioner Walter J. Donnelly, Montreal, to the Department of Commerce. It is being built by the Canadian Government at an estimated cost of $350,000 and is expected to serve as a link in the chain of stops for the proposed dirigible service reported planned by the British Government next year. A large mooring mast will be erected. It is expected that the new airport will be completed within a year.

Say It With Smoke



(c) North American Photo Service

An unusual photograph of sky writing performed by Chas. B. D. Collyer of the Aviation Service Corp. in an S.E.5 to advertise a rodeo recently held in New York City. Collyer had just completed the last letter as the picture was taken.

Report on Pressure Measurement

THE NATIONAL Advisory Committee for Aeronautics recently published report No. 270 entitled "The Measurement of Pressure Through Tubes in Pressure Distribution Tests" by Paul E. Hemke. The tests described in this report were made by the N.A.C.A. to determine the error caused by the use of small tubes to connect orifices on the surface of aircraft to central pressure capsules in making pressure distribution tests. Copies of this report may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

J. E. Carberry Buys Fokker Plane

A FOKKER Universal, built by the Atlantic Aircraft Corp., Hasbrouck Heights, N. J. and powered with a Wright Whirlwind engine was recently shipped to Holland for delivery to Nyeri, British East Africa. The purchaser is John E. Carberry who will use it for his personal use. It will be the latest addition to his string of airplanes which include a de Havilland 51 and a Moth recently purchased for his wife.

I. R. Gates and C. H. Day Form New Aeronautical Corporation

ANNOUNCEMENT HAS been made of the formation of the Gates-Day Aircraft Corp. with offices at 300 Madison Avenue, New York City. The corporation is headed by Ivan R. Gates as president and Charles Healy Day as vice-president and is capitalized at $500,000. M. J. Finkelstein has been retained to serve on the legal staff of the corporation. Designs for a $100,000 factory at Teterboro, N. J., are now being considered. A temporary factory has been leased pending completion of the new building so that production may begin immediately.

Ivan R. Gates, president of the Gates-Day Aircraft Corp.

Both Mr. Gates and Mr. Day are pioneers in aviation. Mr. Day was the designer and builder of one of the first tractor biplanes 19 years ago. In this plane he had an air-cooled radial engine, said to be the first in the world. The engine was both designed and built by Mr. Day. In 1912 in collaboration with Glenn Martin, he designed and built the model TT Martin training plane which was one of the first sold in quantity to the United States government. He also designed and constructed the second airplane ever to complete a loop. The plane was flown by DeLoyd Thompson, known as one of the first "air daredevils". The achievement was of note at this time for until Thompson and Lincoln Beachey turned their planes over, literally within a few hours of each other, it was generally believed that no airplane was strong enough to stand the maneuver.

Charles H. Day, vice-president of the Gates-Day Aircraft Corp.

Mr. Day later became chief engineer and designer for the Sloane Aircraft Corp. which became the Standard Aero Corp. This latter organization produced more than 1,500 planes of the J-1 model, the first training planes of the World War. Although improved upon by later Standard models, they have retained their prestige and many are flying today.

Mr. Gates also has a remarkable record having entered commercial and exhibitional aviation as an exploiter and promotor in 1909 at Los Angeles. He purchased an airplane of primitive type at a bargain, learned to fly and then, in an automobile accident, was so severely injured that he was forced to leave the business for many months.

While still in the hospital he obtained the services of Didier Masson, the French pilot who came to this country in the pioneer days with Louis Paulhan, a flying countryman. In 1909, while still on crutches, he made an exploitation tour as a promoter with Masson. He later conducted aviation meets throughout the country. He has the singular record of having staged more than 2,000 exhibitions in 43 states, and in more than 1,000 cities. He has arranged and exploited most of the flying circus exhibitions for the United States Army Air Service. He gradually worked into commercial flying, and for several years has been operating a flying circus. At the present time he is operating three flying circus squadrons in the eastern section of the country.

The new organization intends to perpetuate, though not in actual design, the Standard planes. Although the bulk of the J-1 models were produced in 1917 and 1918 it is claimed that there are more in service today than any new production type.

Present production plans of the new corporation are for the construction of medium priced air-cooled radial engines for all types of airplanes; small, popular priced sport planes, a conventional type cabin monoplane with a "super-lifting" wing just designed, and an all-purpose commercial plane, designed to be used for training work, carrying of freight, mail and passengers, as well as for exhibition work.

Earle H. Reynolds to Succeed Howard Coffin as N.A.T. Head

ANNOUNCEMENT WAS made in Chicago recently of the election of Earle H. Reynolds of Chicago as president of National Air Transport, Inc., in place of Howard E. Coffin, the retiring president.

Mr. Reynolds is president of the Peoples Trust & Savings Bank of Chicago and is the son of George M. Reynolds, chairman of the board of the Continental and Commercial National Bank. He has been a director in National Air Transport, Inc., since its organization in 1925.

Mr. Coffin has been president of the company since its organization. During his term of office, National Air Transport has grown from a 2,000 mile a day flying organization to one operating 5,000 miles each twenty-four hours. Its planes have flown approximately one and one-half million miles without serious accident, without injury to personnel, or without loss of any cargo. Mr. Coffin will retain an active interest in the N.A.T.

Splitdorf President Goes Abroad

WALTER RAUTENSTRAUCH, president of Splitdorf Bethlehem Electrical Co. and Splitdorf Radio Corp. recently left for Europe to be absent from this country for a month during which time he will deliver a series of lectures and study conditions abroad. Mr. Rautenstrauch was invited before various organizations to talk on industrial topics. The Splitdorf head is regarded a leading authority on industrial engineering. Mr. Rautenstrauch will discuss with the Splitdorf representatives abroad the situation as to radio and automotive and aviation conditions in all of which lines the company is vitally interested. Splitdorf makes all-electric and battery-operated radio sets, radio speakers, automotive and aviation accessories, parts and tools, and specialties in electrical appliances.

Blaw-Knox Co., Constructs Hangar At Winston-Salem in Fast Time

A RECENT letter from the Blaw-Knox Co., Pittsburg, Pa., gives an account of what may be a speed record in hangar construction. The hangar was erected on the Miller Municipal Airport at Winston-Salem, N. C. Speed was necessary in the erection of this hangar because Winston-Salem was to entertain Colonel Lindbergh early in October and at the last of July, when the itinerary of his tour was announced, that city did not have an established airport much less a hangar and other improvements.

By the latter part of August a site for an airport had been obtained. On Aug. 30, an order for a building that would serve as a hangar was long distance telephoned to the Blaw-Knox Co. Anchor bolts were shipped a week later. Within two weeks the complete building was shipped. Erection was started on Sept. 26 and on Oct. 11, the building was completed, including the glazing of the sash, and was ready to extend shelter to its famous visitor, the Spirit of St. Louis.

Crowds greeting Colonel Lindbergh's arrival at Winston-Salem, N. C.

In spite of the fact that the hangar was erected in almost record time only eight workmen were used. The hangar is of steel frame covered with sheet steel. It is made from standard sections thus making quick delivery and rapid erection possible. This building is of the type recommended by the Aeronautics Branch of the Department of Commerce for hangar construction. One of the factors that they cite in favor of this type of building is that it can be erected complete within a very short time after the order is placed. Another factor is the low labor cost involved in erection.

Civil Service Examinations

THE UNITED States Civil Service Commission announces the following competitive examinations: ASSOCIATE AERONAUTICAL ENGINEER, ASSISTANT AERONAUTICAL ENGINEER.

Applications for these positions must be on file with the Civil Service Commission at Washington, D. C., not later than Dec. 27. The examinations are to fill vacancies in various branches of the service throughout the United States. At present there is a vacancy in the position of associate aeronautical engineer in the Naval Aircraft Factory at Philadelphia, Pa.

In the Departmental Service at Washington, D. C., the entrance salary for associate aeronautical engineer is $3,000 a year, and for assistant aeronautical engineer $2,400 a year. In the Field Service of the Navy Department the salary is $9.10 to $11.62 a day for associate engineer, and $7.70 to $8.82 a day for assistant engineer. The entrance salary is usually at the minimum rate of the salary range for the position; but appointment may be made above the minimum rate if the qualifications of the appointee and the duty to which assigned justify it.

The duties will be in connection with original research or investigation or design and construction, in aeronautical engineering. Competitors will not be required to report for examination at any place, but will be rated on their education, training and experience. Full information may be obtained from the United States Civil Service Commission at Washington, D. C., or the secretary of the United States civil service board of examiners at the post office or customhouse in any city.

Pitcairn Aviation, Inc., Makes Lowest Bid on Air Mail Line

THE PITCAIRN Aviation, Inc., of Philadelphia, Pa., was the lowest of three bidders for the operation of an air mail route from Atlanta, Ga., via Jacksonville to Miami, Fla., and return, bids for which were opened at the Post Office Department recently. This concern agreed to carry the mails over this proposed route for $1.46 a pound. Provision will also be made under the terms of the contract to supply Tampa, Fla., with a feeder route, if necessary.

The two other bids received were from the Southern Transport Aviation Company, of Miami, Fla., at $1.74 a pound, and the Southeastern Air Lines, Inc., of Jacksonville, Fla., at $1.95 a pound.

First Curtiss "Hawk" With "Wasp" Engine is Delivered to Air Corps

THE FIRST of an experimental order of Curtiss "Hawks" with the Pratt & Whitney "Wasp" engine was recently delivered to the Air Corps by the Curtiss Company. After flight tests at Mitchel Field, it was flown to Wright Field by Lieut. J. T. Hutchinson. This type of machine, which is a standard P-1B "Hawk" with the "Wasp" engine substituted for the D-12, is almost identical with the F6C-4 type of "Hawk" which has been purchased in considerable quantities by the Navy as a shipboard plane.

A Curtiss "Hawk" powered with a Pratt & Whitney "Wasp" getting off the ground.

Air Corps tactical experts are anxious to get this new type of plane in service so that they may get first-hand information on the comparative performance of present day water cooled and air cooled pursuit planes.

FOREIGN AERONAUTICAL NEWS NOTES

By Special Arrangement with the Automotive and Transportation Divisions, Bureau of Foreign and Domestic Commerce

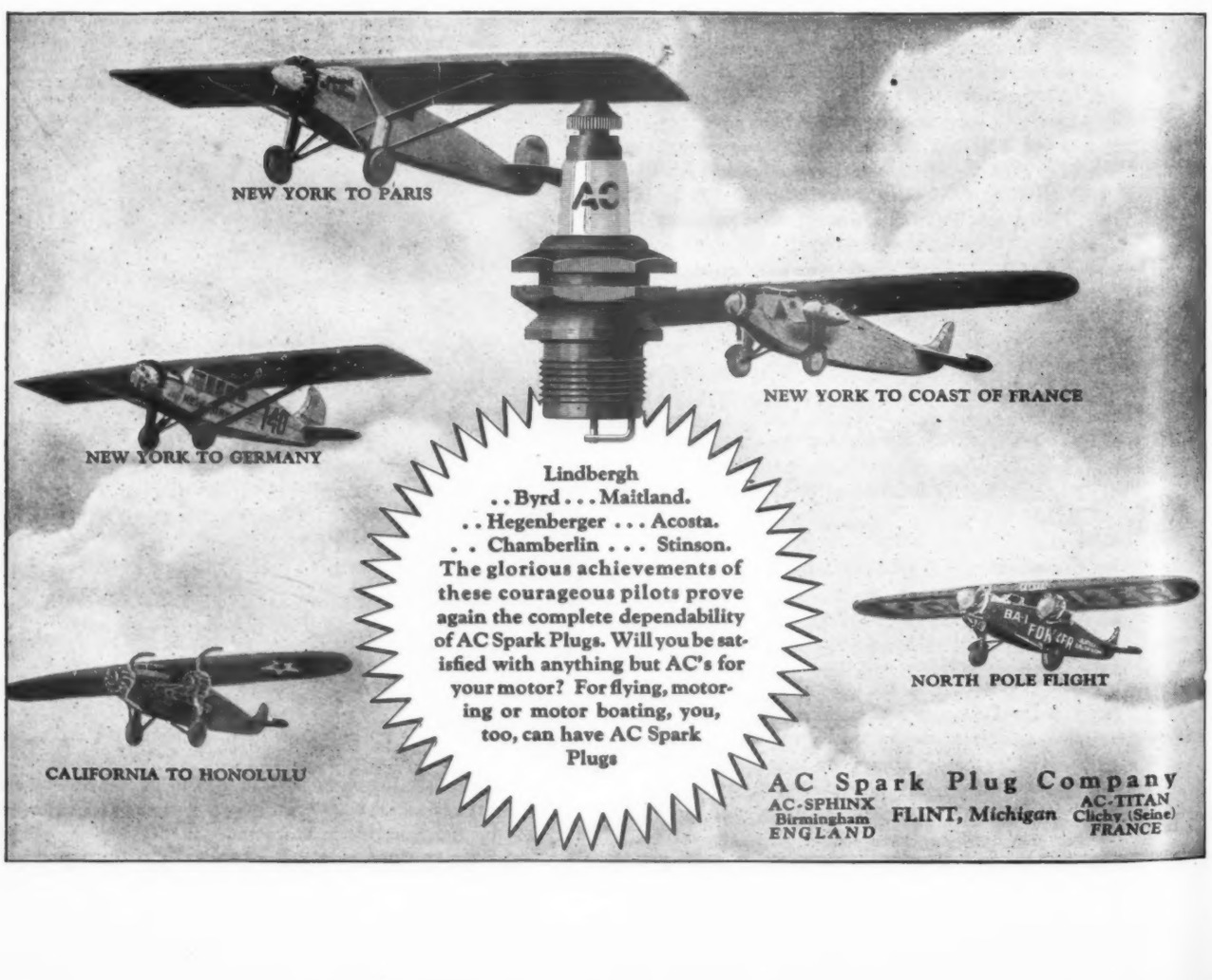
The Royal Aviation Co. (K.L.M.) Report

Netherland commercial aeronautics have maintained a strong position during the year 1926 despite vigorous competition by companies of other nationalities. The German Luft Hansa, the British Imperial Airways, and other companies maintained international services, but the K.L.M., with all of its services under a well organized management, was able to meet their competition.

Services were maintained by the company to London and to Paris from Jan. 1 to April 19, when summer services began. The Rotterdam-Malmo line was opened at that time. From June 15 to Sept. 15, the London service was doubled and from June 1 to Aug. 31, the Paris service was doubled. After Sept. 1, the Paris service was once daily and the London service was once daily from Sept. 15 to Oct. 2, which day marked the end of the summer services and the closing of the line to Malmo. The London and Paris services were maintained through the remainder of the year, once daily. Connections were made between the company's services and those of other air transport companies which made it possible for travelers to fly long distances within a few hours in almost every direction. During the busiest summer season there were three connections per day with London and Paris, two with Hamburg, Copenhagen and Malmo, and one with Brussels, Hanover, Berlin, Bremen, Konigsberg, Moscow, Cologne, Frankfort, Basel, Zurich, Munich, Leipsig, Dortmund, Dusseldorf, and Essen.

Regularity of service was due, in the first place, to the technical department. The number of flights not carried out owing to technical trouble (5) is very small and amounts to only 0.26% and the number of forced landings due to engine trouble was notably small, being only 11 in all. The number of flights not carried out owing to weather conditions (fog especially) was reduced from 11% to 7½%. This was mainly due to wireless communication between aircraft and ground stations.

But for the efficient organization of the technical department, the small fleet used could not have maintained so splendid a record. During 1926 the air-cooled Jupiter engine of 440 hp. was adopted as the standard K.L.M. engine. This type has proved itself a most successful and reliable engine in service. The average number of working hours between top overhauls amounted to 156 for this type, a result never before obtained. The aircraft with their standard equipment showed a minimum of wear and needed very little supervision. The use of metal airscrews gave a


NEW YORK TO PARIS
AC
NEW YORK TO COAST OF FRANCE
NEW YORK TO GERMANY
Lindbergh
. . Byrd . . . Maitland.
. . Hegenberger . . . Acosta.
. . . Chamberlin . . . Stinson.
The glorious achievements of these courageous pilots prove again the complete dependability of AC Spark Plugs. Will you be satisfied with anything but AC's for your motor? For flying, motoring or motor boating, you, too, can have AC Spark Plugs
NORTH POLE FLIGHT
CALIFORNIA TO HONOLULU
AC Spark Plug Company
AC-SPHINX Birmingham ENGLAND
FLINT, Michigan
AC-TITAN Clichy (Seine) FRANCE

higher reliability, a better performance and a simplification of upkeep. To express the efficiency standard of the technical department in figures, it is only necessary to give the percentage of days when aircraft were not available for service. This percentage was 15% in 1925 on account of overhaul and 4% on account of engine trouble. In 1926 these percentages were reduced to 6% and 2% respectively.

In 1926 the fleet of the K.L.M. was enlarged by the purchase of 7 Fokker airplanes type F VII A. On April 10, five Fokker F III machines, which had been on the K.L.M. service since 1921, were sold to the Swiss Company Balair and were delivered by air to Basle. On Sept. 5 and 13, the F VII A machines H-NADJ and H-NADH were sold to the banker, Mr. Lowenstein, and were delivered to him at Paris and Biarritz respectively.

On Dec. 31, 1926, the K.L.M. fleet consisted of the following aircraft.

2 Fokker F II	Siddeley Puma engine
1 Fokker F III	Siddeley Puma engine
1 Fokker F III	Jupiter engine
2 Fokker F VII	Jupiter engine
1 Fokker F VII	Rolls Royce engine
6 Fokker F VII A	Jupiter engine
1 Koolhoven F.K33	3 Siddeley Puma engines
1 Fokker C I	Observer, Siddeley Puma engine

The cabin installation of the first F VII and F VII A machines were altered to give greater comfort and luxury. These new interiors gave great satisfaction to the K.L.M. passengers.

The extensive program of the K.L.M. during 1926 was carried out with F VII A planes. The high standard of efficiency of the F VII A type was demonstrated by the fact that practically only this type was used, even on the double daily services to London and Paris. These services were flown almost entirely with two F VII A machines for London and two for Paris. The long distance service, Rotterdam-Malmo, was carried out with two machines, the reserve machine only being required on one or two occasions. Such efficiency of performance was quite impossible a few years ago, and was due to the increased efficiency of design and construction in both aircraft and engine; longer flying by pilots using machines of high efficiency from a flying point of view, and to the excellent work of the K.L.M. technical departments. All the above services were flown with a staff of only nine pilots.

Despite competition between companies, friendly relations were maintained with others and the company represented the Imperial Airways, Deutsche Luft Hansa, A.B. Aerotransport, Det Danske Luftfart Selshab, Deruluft, Sabena, Air Union, Balair and Lignes Farman.

In 1925 three of the company's machines operating to London were equipped with wireless apparatus and at the end of 1926 all of the aircraft used on the London-Paris routes, numbering eight, were equipped and wireless was used during 2,477 hours of flight during the year.

After the end of the summer season, a training course was provided for the company's pilots in engineering, wireless telephony, and air navigation. While formerly the company took pilots from the Netherland Air Force and put them on regular duty after a short period of training, it took five Air Force pilots at the beginning of the winter season of 1926 and employed them as assistant pilots throughout the winter, thus giving them a longer training period.

From a technical and a commercial point of view, the year has been extremely important; technical progress has been particularly noticeable and the use of air cooled engines and metal propellers has aided in improving the company's efficiency record. The increased accuracy of instruments, reliable directional wireless communication between aircraft and airports aided in the regularity and safety of services. The government and the public have shown appreciation of the company's efforts and it is determined to exert every effort toward creating a powerful Netherland Air Traffic in the Netherlands and in the colonies.

The AIRSEDAN

Safety

Built under Department of Commerce Certificate of Airworthiness **No. 12.** *Approved for* **1000 lbs.** *pay load.*

INSURANCE

Full coverage will be granted for all passengers, because they cannot interfere with the controls.

SPECIFICATIONS

Seating Capacity	pilot and 4 pass.
Weight Empty	2100 lbs.
Wing Area	320 sq. ft.
" Span	42 ft.
High Speed (sea level)	120 M.P.H.
Engine,	Wright Whirlwind

EQUIPMENT

Self Starter, Metal Propeller, Compass, Air Speed Indicator, Navigation Lights, Tachometer, Altimeter, Clock, Fire Extinguisher; Fuel, Oil Pressure and Oil Temperature Gages; Air Corps Throttles, Strainer, and Fuel Valve, Exhaust Manifold with Muffler and Cabin Heater, Metal Mail or Baggage Compartment.

The Ideal Commercial Plane

Price $12,500 Flyaway
Completely equipped

BUHL AIRCRAFT CO.

Marysville, Michigan

PUBLISHER'S NEWS LETTER

Congress convenes on the same day as this issue is dated. And it is pleasant to be able to greet the incoming Seventieth Congress with a feeling of confidence that it will be "air minded" to a degree almost bordering on enthusiasm, if such an emotion can ever be ascribed to those who have the power of appropriating money. As a matter of fact, Congress has always received too little credit for the part it has played in the advancement of aviation in this country. Somehow the Executive Branch of the government, with its experienced and well organized publicity bureaus, has always taken all the praise and shifted the blame on the legislative bodies. All of which has been very unjust, even when unintentional. But Congress seems to be unpopular with the mass of people, probably because there is so much talk and so little done that meets with unanimous approval. A forum that is a continuous battle-ground, where victories are gained after bitter verbal contests is never apt to be exactly popular. But when the past is considered dispassionately and due allowance made for a cumbersome procedure, the history of Congressional support of aviation is worthy of much praise which has seldom been expressed.

* * * *

From the earliest days of the Wrights and Langley, both houses of Congress have listened patiently and usually sympathetically to the optimistic claims of the experimenters in the new art of flying. Before the War, while appropriations were small, they were likewise given without much hope of practical return. When the War broke on us, Congress responded to the urgent cries from overseas for greater air power with its largest single sum ever appropriated for any purpose. And this was done without even a debate. After the War the situation became so involved that hardly anyone could predict with any degree of certainty just how far peace-time aviation would go. But in spite of the constant harpooning of our war program by an industrious group of disgruntled and disappointed visionaires, Congress gave the services practically every cent that was asked. But while this was going on officers of the services were blaming Congress as tactfully as they could for the deficiencies of the aeronautical program. At the same time money was being returned to the Treasury out of appropriations unspent because the services did not know how to use all they were given. What is equally important is that every year's appropriations since the post war deflation have been steadily increasing in spite of the tendency to reduce armaments and curtail the Army and Navy. All of which should be clearly understood by the thousands of newcomers to the aviation field who have probably been misled by the newspapers that always publish attacks with great display but the denials if ever published are not regarded as interesting news and are printed inconspicuously.

* * * *

Another way in which Congress has assisted aeronautical development has been in securing information through hearings before its committees and investigations. Notwithstanding the extreme secrecy with which some governmental officials surround their work, whenever a Senator or a Congressman asks for some information, particularly at hearings, these same officials spread on the record not only what is asked for but much other information that is apparently intended to impress Congress with the activity of the persons concerned. This has provided a record of government aviation which for completeness is unequalled. The investigations have done little more than permit a great deal of exhaust gas to escape except as they have provided a very complete record set down under a more hostile form of questioning than is customary at committee hearings. Investigations seldom clarify a situation, and as the result of those held by congress, little of a constructive nature has been accomplished.

* * * *

The coming Congress faces a clear road, comparatively speaking. Last year was the first during which the Five Year Program was considered. This year the work so well begun will only have to be extended under the suggestions of the President and Director of the Budget. The general impression is that Congress will appropriate all that is asked for by the various departments concerned with the use of aircraft. If this is true, the situation will be very much like the present industrial condition in the country at large. Everyone appears to be happy, factories are working on good orders, both governmental and civil airports are being built, in fact prosperity seems to be the only word to apply to the aeronautical field. The best policy, particularly viewed by those who have been through the distressing past, is perhaps best indicated by an adaptation of the expression "don't rock the boat" into an aeronautical expression "don't stall, keep your eye on the horizon".

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W. Mo. and E. Kan.—Bennett Eaglerock Sales Co., 223 W. 12th St., K. C., Mo.
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N. M. & Cen. Texas—Browning Airplane Sales, Wichita Falls, Tex.
S. Tex.—Marion P. Hair, 403 E. Josephine St., San Antonio, Tex.
So. Cal. and Ariz.—Aero Corporation of California, Western Ave., at 99th St., Los Angeles
Northern Calif.—Jas. L. Mayberry, Menlo Hotel, Oakland, Calif.
W. Wash.—Story Eaglerock Sales, 409 N. Yakima, Tacoma, Wash.
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W. Kan. and E. Neb.—Steele Airlines, Inc., 717 Union State Bank Bldg., Omaha, Nebr.
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Mississippi—Tri-States Airways, Bry Block, Memphis, Tenn.
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So. Carolina—Errett Williams, Spartanburg, S. C.
Me., N. H., Vt., R. I. and Mass.—Massachusetts Airways Corp., 1597 Main St., Springfield, Mass.
W. Penn. and N. E. Ohio—Morris Flying Service, Pittsburg, Pa.
Northeastern Indiana and Western Ohio—Indiana-Ohio Aero Corp., 203 Carroll Bldg., Ft. Wayne, Ind.

Side Slips

By ROBERT R. OSBORN

Mr. H. M. H. sends in a clipping from a newspaper magazine story he has been reading, asking for an explanation of the italicized portions—

"Fully expecting to see the plane start to taxi towards the other machines, Lucky was filled with excitement as its pilot climbed out, *leaving the propeller turning over,* and walked to the side of the airdrome where two German officers were waiting for him. ******* He had fifteen yards yet to go when they saw him. Shouting to him and jerking Lugers out of holsters, the Germans rushed after Lucky as in a last flying leap he dove feet foremost into the cockpit of the Fokker. *Frantically he fumbled for the ignition lever, found it, and rammed it open.*"

We are sorry we can't offer any explanation to H.M.H as to why it should be necessary to "open" an ignition switch when the propeller is already turning over, but we can testify that the condition is not impossible with some motors. With our own Antique Coupe, for instance, the motor often runs for half an hour after we've turned the switch off.

* * * *

Speaking of the seaplane which has been waiting at the Azores for good weather for the hop to the mainland, a newspaper article says, "The plane left Norderny, Germany, October 4, to fly to the United States in a demonstration of the practicability of trans-Atlantic flying." We'd say the flight had at least demonstrated the necessity of allowing stop-over privileges on all tickets.

AIRPORTS AND AIRWAYS

Kokomo, Ind.

By Harold M. Barnes

The Flying Farmer Air Circus, organized by Clyde E. Shockley, manager of Shockley Flying Field, Kokomo, Ind., recently completed a two months tour of Ohio and Indiana. The circus was a success from every standpoint. The pilots were Clyde Shockley, flying a Swallow, "Red" McVay, of Fort Wayne, flying a Waco-9, and O. L. Crabill of Huntington, flying a Waco-10. The mechanics were Harold Barnes, Von West and McDonald. Gene Rock of Fort Wayne was the stunt man. At the various cities which were visited, the circus was always in action. The crowds were estimated at two to three thousand during the week days and five to eight thousand on Sundays. Gene Rock was requested constantly to repeat his aerial stunts, which consisted of a single parachute jump, followed by a double parachute drop. Gene also performed on a trapeze hung on the landing gear of the Swallow. This act consisted of hanging by both hands, by one hand, by one knee, by both knees and by both feet. In conclusion to each days act, he walked the wings while the plane flew at high speeds. The "Flying Farmer" each afternoon took the Swallow up 2000 ft., cut the switch and proceeded to make a dead stick landing to within a few feet of a designated spot. This act was for the purpose of showing the public that one would not crash although the engine was dead. This one act encouraged the people as to the safety of flying, resulting in an increase of passenger carrying. "Red" McVay gave an exhibition in his Waco-9, showing the spectators the elementary maneuvers a student is taught while undergoing instruction at a flight school. Before each flight, announcements were made as to its purpose. One of the main objects of the circus was to stimulate interest in commercial flying and to give the public a chance to see the latest in modern commercial airplanes. The crowds were permitted to inspect the planes during the mornings.

Santa Monica, Calif.

By George L. Geiger

Frank Baker, son of the president of one of the Pacific Coast's largest shoe companies, operating the Baker Airport, in Culver City, near Venice, and Bob King, a Los Angeles aviation enthusiast, brought a Waco 10 from the factory at Troy, Ohio, to the Culver City Field, Baker being Waco agent for Los Angeles County and King being the purchaser of the machine. The two journeyed to the factory by train and, en route home via air, visited airports along the way, having a wonderful trip, according to both.

A. L. Acheson, Santa Monica Bay district manager for the Pacific Development Corporation, conducted an air expedition

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to the Carl Pleasant Dam near Phenix, Ariz., three planes with six passengers each, making the inspection visit. The dam is in the Salt River Valley and one of the largest privately owned enterprises in the country, backing water for irrigating 40,000 acres. By using airplanes, Mr. Acheson and his associates were able to make the trip over the week-end.

The giant Fokker, "Southern Cross", being groomed for a flight from Oakland, Calif. to New Zealand, has been visiting Clover Field, making the journey from Northern to Southern California to permit the Douglas Company's engine experts to go over the three engines. The plane, with a wing spread of 72 ft. and a gasoline carrying capacity of 1339 gal., is in charge of Capt. Kingsford Smith, Australian war ace.

The hop-off, although not definitely set, will be made sometime during the early part of this month and the first jump will be to Honolulu, then to Suva, in the Fiji Islands, and then the final leg of the 6900 mi. jaunt, most all of it over water. It was also learned that the plane, after returning to Oakland, will attempt to break the endurance record as a test.

Captain Smith's crew, housed in a capacious and comfortable cabin, consists of Keith V. Anderson, co-pilot; William A. Todd, navigator; George Pond, mechanician and Charles T. Ulm, co-navigator. Because of the unusual size and overall weight of the "Southern Cross", a special landing gear is being built for attachment when she sets off over the Pacific.

Los Angeles, Calif.

By Charles F. McReynolds

New cabin planes have been arriving in Los Angeles with such speed and regularity of late, and new passenger airlines are being so rapidly rumored or projected that the local observer who seeks to keep pace with all the developments in the aviation industry hereabouts is in somewhat the same condition as a conscientous little boy at a three ring circus —decidedly pop-eyed.

The most spectacular entree was that of Jack Maddux with the second Ford plane to reach the coast. Flown by Larry Fritz, and carrying Mr. and Mrs. Jack Maddux, Mr. and Mrs. Raymond Hatton, and Mr. and Mrs. Wallace Beery as passengers, the big three engined Ford product slipped quietly into Griffith Park Airport, north of town, at 5:40 P.M. recently. The next morning Larry Fritz took off with his plane empty, flew directly across the heart of Los Angeles on his way to the home port southwest of town, and gave such an exhibition of the maneuverability as the natives will not soon forget. After a series of figure eights, zooms, side slips and vertical banks, with all the engines full on, almost everyone in Los Angeles knew that the second Ford air liner had arrived.

Second Ford Plane in Service

The second Ford plane was placed in service on the Los Angeles-San Diego passenger run. It is similar to the first plane except that several of the seats may be converted into berths while the plane is in flight, and for this reason it is being advertised as an aerial "Pullman".

When the third Ford plane arrives, Jack Maddux is planning a scouting trip over the route of his proposed Los Angeles-El Paso line. The original plane to be placed in service here is now being used as a demonstrator and is in great demand for local sight seeing trips.

While the all-metal Ford plane created a great stir upon its arrival, it was preceded to the coast by the third Fokker Universal monoplane to be brought here by the Aero Corporation of California, flown by Jack Frye, president, and also

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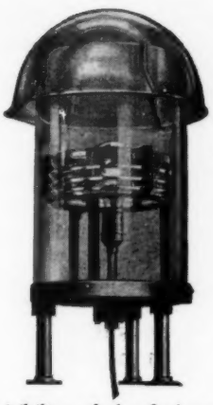

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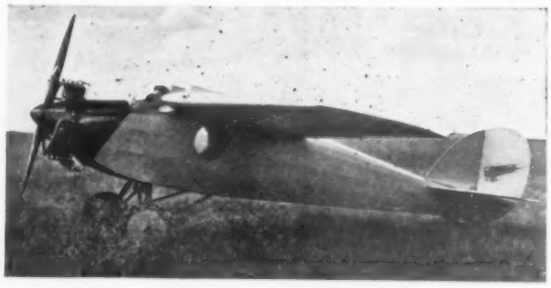

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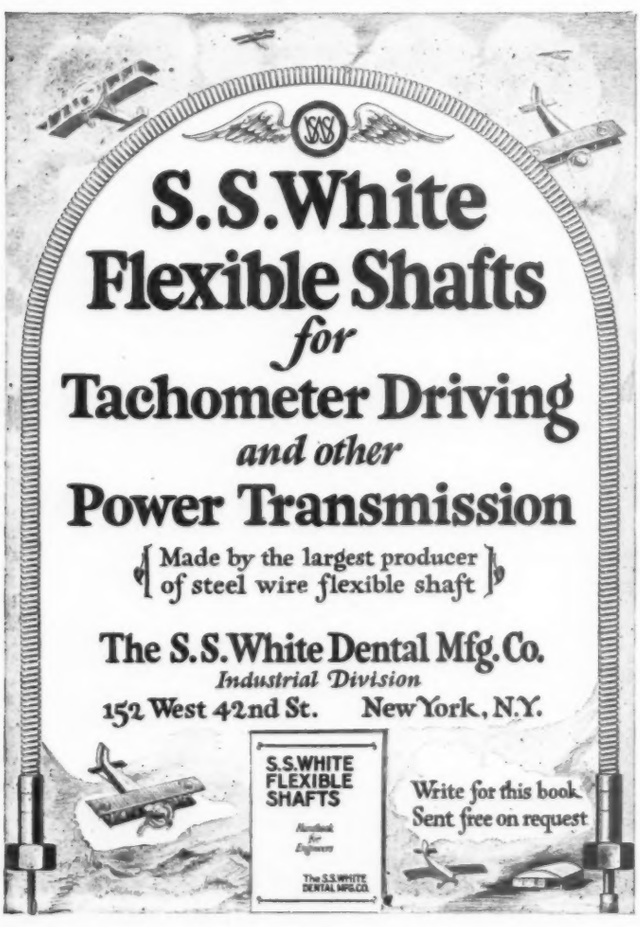

by the second Fairchild monoplane to reach the American Aircraft Co.

The present cabin plane situation shows three local flying companies that have brought two or more to Los Angeles. The Maddux Air Lines expect the arrival of a third very soon, Paul Richter, of the Aero Corporation of California, is now on his way east to take delivery on the fourth Fokker Universal monoplane for that company, and the American Aircraft Co. is waiting on the factory for further deliveries of Fairchilds.

At the end of their first month at the new field on Mesa Drive, the American Aircraft Co., Fairchild and Waco distributors for California, are operating two Fairchilds and have sold a third pending delivery, have sold and delivered twelve Waco biplanes and have signed fifty students for the flying school. Theodore Hull, vice-president of the Pan-American Bank of Los Angeles, is the business "dynamo" of the concern, and J. B. Alexander, sales representative and pilot, and "Doc" Whitney, field manager and pilot, are the "spark" and "plug" respectively, which complete the "circuit" in this fast moving organization.

No definite assignments of Fairchild sub-dealerships has as yet been made and for the present the established Waco dealers are representing the Fairchild interests in California. These sub-dealers are: The Pacific and Atlantic Airways, Oakland; Jones and Ailor, San Mateo; Dowling and Mauriee, Fullerton; Walter Eefsen, Fresno; and Rogers and Tison, Brawley.

Two Scenic Air Tours

Of the two Fairchilds now in service, the one flown by J. B. Alexander is being used as a demonstrator while "Doc" Whitney is busy keeping up with the schedule laid down on two new scenic routes.

The first of these flights is a round trip from Los Angeles to San Francisco, making the trip north by way of the famous ridge route and skirting the western base of the High Sierras to the Yosemite Valley, which is circled, and then proceeding to San Francisco for an overnight stop. The return on the second day is made via the coast route, flying a large share of the way over the beach.

The second trip is a one day round trip flight from Los Angeles to San Diego, flying east over the orange groves of Riverside County and out over the Mojave Desert to the Salton sea, south over the Imperial Valley to the Mexican border, west along the northern side of the border to San Diego for a short stop, and then back to Los Angeles by the coast route. On week ends the regular short excursion tours over Los Angeles keep the plane in the air from forenoon until dark.

The first Fairchild was sold to a moving picture company for aerial photography, in order to supply the aviation angle to so many of the theatre goers who are demanding air news and views.

"Doc" Whitney demonstrated the versatility of the All-Purpose Fairchild plane recently when he flew from San Diego to Tucson, Ariz., with a passenger from a San Diego hospital who was so seriously ill that he could not be moved by train. The trip by air did not in any way injure the patient and he is now on the road to recovery in a Tucson sanitarium.

Of the twelve Waco's sold by the American Aircraft Co. during the month of October two each went to the Pacific & Atlantic Airways in Oakland, Rogers and Tison, Brawley, and Jones and Ailor, San Mateo, while one each was delivered to Ralph Daughne, Los Angeles, Walter Eefsen, Fresno, Claude Ryan, San Diego, James Mattern, Los Angeles, and Edward Thornley, San Diego.

Claude Ryan is equipping his Waco with a Ryan-Siemens

radial engine for test purposes and one of the two planes for the Brawley agency is being delivered to the new Calexico Flying Club, which was organized by twelve young men who are as yet non-fliers.

The Fokker Universal is proving very popular in Los Angeles. The Aero Corporation of California, local distributors, has sold two to Pacific Air Transport since taking over the distributorship, and is operating a third from the Western Ave. Field. Paul Richter has left for the east by train, to bring a fourth out. The Aero Corporation of California is ferrying these Fokker Universals out just as rapidly as it can get delivery from the factory.

While Jack Frye was east for the third Fokker, Lee Willey made two long cross-country flights with passengers, one to Dallas, Tex., and another to Phoenix, Ariz., as well as several trips as far as San Diego.

The first week end following the arrival of the new Fokker a low excursion rate was adopted for a short sight seeing trip over Los Angeles and passengers stood in line from 11 A.M. until dark waiting their turn for a place in the overworked excursion plane.

The Aero Corporation of California has sold six Eaglerock biplanes in the past month and has four orders waiting delivery from the factory.

Anthony Fokker, a recent local visitor, was invited to address the Los Angeles Breakfast Club and in return extended an invitation to twelve members of the club to have breakfast with him five thousand feet in the air in one of his own planes. President DeMond accepted and the breakfast was held the following morning with Mr. DeMond; Mayor Baker, of Portland, Ore.; George W. Bunton; Harry Rimmer; Col. T. H. Bane; Lieut. Victor Bertrandis; Capt. Charles Kingsford-Smith; Edward Halperin and C. B. Allan as the guests.

Around-the-World Flight

Every aviation organization in Southern California is cooperating to make the third annual Around-the-World Flight celebration at Clover Field, Santa Monica, the greatest air carnival ever staged in the west.

The meet is being sponsored by the Southern California Chapter of the N.A.A. and it is said that more than one hundred military and civilian planes will participate for the $1500 in prizes. A complete plane, engine and equipment display has also been arranged. Army planes have been promised from Crissy Field, San Francisco, March Field, Riverside, and Navy planes will attend from North Island, San Diego. The high speed races will feature service types capable of 200 m.p.h. while a cross-country tour for light sport planes has also been arranged which will touch at almost every Southern California airport.

With at least four companies already projecting airlines for passenger traffic east from Los Angeles, comes the announcement from Major Howard F. Wehrle of Kansas City, Mo., that he has completed the organization of a $275,000 company that will soon open a passenger airline over the Los Angeles-Dallas route, flying with an initial equipment of eighteen Travel Air cabin monoplanes.

A glance at the list of recent passengers in local flights tends to show the universal popularity of this new mode of travel.

Mrs. Waldo Johnson, a society matron of Cooperstown, N. Y. recently arrived at Vail Field in a Western Air Express plane piloted by Jimmy James, and is the first woman passenger to make a through transcontinental flight over established airlines.

Led by Miss Elsee Greene, their instructor, eleven ladies of the Los Angeles Athletic Club gymnasium class recently made flights in groups of three from Short's Airport, with pilot Stanley R. Short.

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Grand Canyon, Ariz.

The Grand Canyon Airport, which is now under construction, is 7,000 ft. above sea level and is situated at the foot of the Red Butte mountain. It comprises 768 acres, which makes it one of the largest airports in the country. It has three runways, the shortest one of which is 4,300 ft. east and west, and the other two are over a mile in length. Due to soil conditions at the Grand Canyon, B. Russell Shaw & Co., who is constructing this airport for the Scenic Airways, Inc., has built a hangar entirely of steel frame, 80 ft. wide in front, 50 ft. wide at the rear, and 90 ft. in length. The field is equipped with night landing lights, an oil house, executive offices, a passenger waiting room, shops and pilots' sleeping quarters.

Lack of labor and materials has presented difficulties to the engineers. All the water used has to be hauled from Flagstaff, Ariz., a distance of 90 miles, and the steel trusses over narrow winding roads, a distance of 18 miles from the railroad station. The steel for the hangar was ordered and shipped from St. Louis.

The Scenic Airways, Inc., has been using the field for three weeks, although construction is not yet complete.

Boise, Idaho

By Robert Blackstone

In cooperation with oil interests and in compliance with the request of Secretary of Commerce Herbert Hoover for marking of cities in the interests of commercial aviation, 13 Idaho towns have painted names on the roofs of the tallest buildings for the guidance of pilots, announces Cyril C. Thompson of Boise, Idaho, governor of the National Aeronautic Association.

The places that have been marked are Spirit Lake, Kellogg, St. Maries, Potlatch, Moscow, Orofino, Lewiston, Craigmont, Grangeville, Weiser, Caldwell, Boise and Twin Falls.

Idaho is listed as having four fields out of the 173 in Washington, Oregon, California, Arizona, Nevada, Idaho and southwestern Utah. The usable fields are listed in a handbook issued by the Standard Oil Company of California.

The four Idaho airports on this list are Coeur d'Alene, Kellogg, Wallace and Boise.

Des Moines, Iowa

By H. A. Lindbergh

Des Moines is one of the two Iowa cities on the transcontinental air mail route operated by the Boeing Air Transport.

The Des Moines Chapter of the National Aeronautic Association, of which George Yates is president and George W. West is secretary-treasurer, are active in the development of the city's aviation activities.

The airport committee of this organization is at present working in cooperation with the city officials as well as other civic organizations on various projects.

Information is being collected and plans are being prepared so as to be in readiness to conduct a drive for an up-to-date hangar on the new municipal field.

It is the desire as well to bring all commercial flying activities to this airport and they hope these projects will be completed by early spring.

Hartford, Conn.

By B. A. Pollet

The New England Aircraft Corp. has received its first Fairchild monoplane. It was flown to this field from the Fairchild plant at Farmingdale, L. I., by Percival H. Spencer, president of the New England Aircraft, accompanied by R.

C. Barrows, the vice-president, and a passenger. The monoplane is a standard type powered with a Wright Whirlwind engine, and will be used for demonstration purposes, this concern having the New England agency for its distribution. They also have the distributing agency for the Waco planes and will take over the Worcester Airport located at Worcester, Mass., opening an office there under the management of Captain Stickney of Hartford and Stuart Chadwick of Worcester. In addition to work incidental to such distribution, they will conduct a school and do such commercial work as will become available.

The Connecticut National Guard Air Squadron expects to receive eight new PT-1 Consolidated training planes to take the place of the Jennies. Two of the PT-1's have already been received and are proving worthy successors of the inimitable Jennies.

A new aviation company has been organized and will begin operations with headquarters at Brainard Field. It will be associated with the New England Aircraft in the distribution of the Fairchild monoplane through a sub-contract, and in addition will do the aerial survey for the Fairchild Aerial Survey Inc., of New York. It will distribute the Swallow airplane in New England and eastern New York with the exception of Hamilton County.

A company, to be known as the L & H Aircraft Corp., was incorporated in Connecticut, with the following officers: president, C. B. Beach; vice-president, Major Wm. F. Ladd; secretary and treasurer, Lieut. Osmond M. Mather, and assistant secretary and treasurer, Thomas W. Campbell. The directors of the company are: the president, vice-president, secretary and treasurer, Edward N. Allen, Benedict Holden and Harris Whittemore, Jr., of Naugatuck, Conn. Lieutenant Mather will be chief pilot and in general charge of operations.

The Colonial Air Transport, Inc., is augmenting its equipment with the purchase of two Pitcairn Mailwings to be utilized in their service on C.A.M. between New York, Hartford and Boston. The planes are powered with the Wright Whirlwind engine and will be placed on the run immediately.

The appointment of Capt. Dudley E. Rowland as chief of operations of the Colonial Air Transport, Inc., has been announced, to succeed Leroy H. Thompson deceased. Captain Rowland will make his headquarters in New York at the offices of Colonial Air Transport, 270 Madison Ave.

Bridgeport, Conn.

The Bridgeport Airport, Inc., headed by Col. Rex B. Delacour, has purchased land on the Lordship meadows, from the various owners, and it is hoped to have Bridgeport's field equipped and ready for operation by June of next year. Contracts have been made for the necessary dredging and filling in, and the town of Stratford is cooperating with the Bridgeport backers of the project by granting permission to make a 250 ft. cut through Short Beach, near the mouth of the Housatonic river, so that seaplanes also may be accommodated at the port.

William E. Arthur & Company, Inc., New York City, aeronautic engineers and builders, who has charge of the construction work, has established an office at the site of the airport and a force of 35 men is employed.

The field has been laid out as a four-way one, with a north-east and a south-east runway 300 ft. long and a north-west and a south-east runway 500 ft. long.

The following prominent men of Bridgeport business circles are associated with the Bridgeport Airport, Inc.: Rex B. Delacour, of Stratford, a member of the legislature, chairman of the aviation commission of the state, and president of the company; Andrew R. Smith, of W. R. Bull & Co., a pilot

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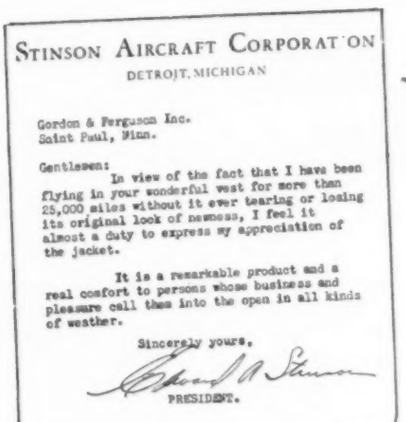

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in the U. S. Air Service during the World War, and treasurer of the company; George C. Fraser, Jr., of the American Tube & Stamping Co., also a War pilot, and vice-president of the company; W. Parker Seeley, of the law firm of Pullman & Comley, World War pilot, and secretary of the company; John P. Ramsey, construction engineer, formerly of Bridgeport, but now of Brookline, Mass., an officer in the U. S. Army during the War, and a director of the company; Harold Delacour, of Stratford, with the Bullard Machine Tool Co., a pilot in the War, and a director of the company; and W. Gerald Bryant, of the Bead Chain Co., and a director of the company.

Wallingford, Conn.

A new airport was opened recently at Wallingford, Conn., with appropriate ceremonies and an air meet lasting three days. The field has an area 3000 by 1200 ft., and is located within the town. A fine state road runs along one end and promises to be an important stopping place for planes en route from New York to Boston. It is a municipal field, was sponsored by the city of Wallingford and the chamber of commerce, and, when improved, will prove a valuable addition to the fast growing number of small but well equipped landing places so necessary to the proper development of popular aviation.

The air meet was well attended and the crowds were kept in a state of excitement by the antics of two Curtiss Hawk pursuit planes from the Quantico Station. Lieut. A. L. Caperton arrived in the Reynolds Airways tri-engine plane and did a brisk passenger business, as did also Percival H. Spencer in the Fairchild monoplane. Walter Johnson, of Middletown, completed each day's program with a well executed parachute jump and the ceremonies were satisfactorily closed with the visit of Governor John H. Trumbull.

Springfield, Mass.

By Charles Hanson Gale

Lieutenant Hall has graduated his first class from the Springfield Ground School which he is operating. There were 20 in the class which finished the 10 weeks course. Another course was started at once and has additional equipment on the way. The OX5, with which Lieutenant Hall began his instruction, has been augmented by a Hall-Scott.

The Springfield School of Aeronautics, of which Lieut. Albert Glode is the instructor, has been under way for several weeks and the project promises to be very successful. The company has acquired a Rhone rotary air-cooled engine as part of its equipment.

The conference on flying clubs of New England, which the Flying Club of Springfield proposed to hold the middle of November, has been postponed until January. The large amount of interest in the project shown by New England and outside interests caused the club officials to postpone the affair so that a larger and more comprehensive conference might be held. The secretary of the club will be glad to be put in touch with others who might be interested in the affair.

Boston, Mass.

By Daniel Rochford

Airplanes did a great job during the New England floods. Through the commercial planes of the Boston Airport Corporation, Montpelier had its first communication with the outside world. Chief pilot B. F. Billings made two trips landing on the second, and carrying yeast to the bakers whose supplies might otherwise have run out. The Army collected a half dozen planes from Mitchel Field and established a base at Concord and at Fort Ethan Allen. Lieut. Richard E. Cobb of Boston was the first Army pilot to reach Mont-

pelier, carrying in anti-typhoid medicines. Snow storms hampered the flood relief work two days but after that the planes got in regular patrols. The citizens of Barre turned to and built an emergency air field with a wind cone, marked circle and leveled runways the first working day after the flood. This was done before contact with the outside world was opened because the people expected airplanes would be the chief relief vehicles used, until new bridges and roads could be built.

Major Gen. Preston Brown, the corps area commander, flew to the flooded regions in one of the Loening Amphibians sent up by the Army. He conferred with Assistant Secretary of War for Aviation F. Trubee Davison at the airport before flying north again. Captain Eaker flew the secretary to Boston.

The Boston Airport Corporation established regular delivery service for yeast and medicines. Pilots flying to the floods included Ralph Wickford, Robert Nagle and Robert L. O'Brien. Many newspapers sent photographers and news men north by plane. Lieutenant Thomas, of the Navy, flew up in his Vought plane. Capt. C. W. Ford, assistant corps area air officer, handled the general arrangements for the Army's planes on the flood work.

The flood took precedence over everything else. The Harvard Flying Club sent its plane up with Crocker Snow, Frank Sproul, and Eric Wood. Air Service of New England, Inc., had photographer Parks, from the Fairchild plant, in Boston, but waived prior claims on planes for the flood relief work, thus delaying contracts for a number of town maps in Massachusetts.

Milwaukee, Wis.

By H. C. Brunner

A 700 mile air tour of the state conservation department over northern Wisconsin recently aroused much interest here. The tour lasted two days. The "Stanolind", an eight passenger plane belonging to the Standard Oil Company of Indiana carried, besides Governor Fred R. Zimmerman, conservation commissioner L. B. Nagler, E. M. Dahlberg, of Ladysmith, and William Mauthe, of Fond du Lac. The object of the flight was to make a forestry survey of Wisconsin.

The plane flew from Madison to Oshkosh, by way of Columbus, Beaver Dam, and Fond du Lac. An overnight stop was made at Oshkosh and the next jump took the party to Wausau, flying in a roundabout way via Neenah, Appleton, Manitowoc, Green Bay and Shawano. From Wausau a side jaunt was made to Marshfield, Neillsville, Eau Claire, and Ladysmith.

Wisconsin cities were so interested in the recent air tour of the Alonzo Cudworth post of the American Legion that they sent delegates to a meeting of the post asking that their cities be included in the next tour.

John M. Nichols, general chairman of the post tour committee, announced that the second annual tour will be held June 11 to 16 next year. On this tour 25 planes will visit about 20 cities, and it will be widened to include Minnesota, Illinois and Iowa, in addition to Wisconsin.

Entrants will be limited to Wisconsin concerns of national importance, Mr. Nichols stated. He also said that there would also be a plane representing the U. S. air mail, one from the Aeronautics Branch of the Department of Commerce, two press planes, one representing the city of Milwaukee, and an Army plane. All planes will be different models.

The tentative itinerary for the 1928 tour was outlined as follows: Monday, June 11, Sheboygan, Manitowoc, Oshkosh (luncheon), Marinette and Green Bay; Tuesday, June 12, Neenah, Stevens Point (luncheon), and Wausau; Wednesday, June 13, Eau Claire (luncheon), Minneapolis and St. Paul; Thursday, June 14, Rochester (luncheon) and La Crosse, Minn.; Friday, June 15, Dubuque, Iowa (luncheon),

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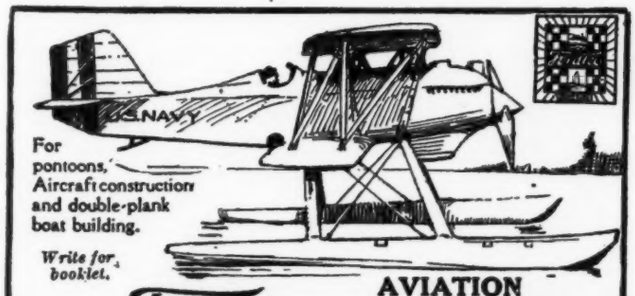

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Rockford, Ill., and Madison, Wis.; Saturday, June 16, Janesville, Kenosha (luncheon), and Milwaukee.

Invitations have been sent to Clarence D. Chamberlin, and Fraulein Thea Rasche to visit Milwaukee while on a tour of the Great Lakes region.

Aviation interests in Wisconsin have asked for rates on compensation insurance coverage, for the Wisconsin compensation law requires that any concern having three or more employees at any time during the year must carry insurance to protect the men.

The increasing number of corporations which have been formed to engage in commercial aviation has made it imperative that rates be established. The Wisconsin compensation and rating bureau has not made a rate for such coverage in Wisconsin and where compensation insurance has been written it has been an arbitrary rate of so much a pilot.

The bureau has received information from the national advisory bureau on three suggested classifications, in all of which the rate is based on the amount of the payroll. Stuart Auer, Milwaukee airplane enthusiast, has induced the Wisconsin bureau to hold up adopting these classifications or making rates of any sort until he can get expressions from commercial aviation concerns and insurance companies who will write the insurance. Mr. Auer has written such companies asking them to make suggestions.

Columbus, Wis.

An intermediate landing field is being fitted up at Columbus, Wis., with a large revolving beacon light. Portage is the regular stopping place between Milwaukee and La Crosse, on Airway No. 9, but the Columbus field is being provided and equipped because early darkness at this time of the year sometimes makes landings necessary.

The Columbus field, which is T shaped, will probably be complete by Dec. 15. It will be entirely surrounded by small lights, close to the ground, which will give a clear outline of the field at night. These smaller lights will supplement the larger automatic beacon light which will be on a 75 foot tower and will be in continuous operation after dark.

Pilots will be able to identify the field during the day by a large concrete marker, located in the center of the field. This will be painted a bright yellow, and its shape will indicate the direction and shape of the field, so that pilots can tell at a glance just where all the boundaries are. A large directional arrow, 65 ft. long, will also aid planes in making landings.

Madison, Wis.

The Blackhawk Electric Company was recently awarded the contract for installing seven floodlights, one beacon light and 17 boundary lights on Pennco Field, Madison's temporary airport for the mail planes. The first power beacon and flood lights were also recently installed at the Madison Airport.

Max H. Kliefoth, a German pilot, hopes to qualify within the next few weeks for a United States pilot license. Howard Morey, chief pilot of the Madison Airways Company, is supervising the solo flying being done by Kliefoth, the requirement for a license being a five hour solo flight, supervised by a licensed American pilot. Although Mr. Kliefoth has done little flying since 1923 he has over 5,000 hours in the air to his credit.

Wausau, Wis.

Governor Zimmerman visited the Wausau Airport recently, arriving in the Standard Oil Company's plane, "Stanolind". While here, he officiated at the laying of the corner stone of the new six-plane, steel and concrete hangar, which is being constructed at the port.

UNITED STATES AIR FORCES

Air Forces to Use Emergency Airdromes

In wartime, airplanes with the armies will be forced to operate from emergency airdromes as well as from permanent ones equipped with extensive supply and maintenance installations. Realizing this, the War Department in a communication to corps area and department commanders, commenting on the air-ground maneuvers held in the vicinity of San Antonio, Tex., earlier in the summer, emphasizes the necessity for practice, in future maneuvers, in operations from emergency airdromes utilizing only such supplies and personnel as may be placed therein by means of the air and ground transportation assigned to the units involved. The use in the past of permanent airdromes, has simplified air operations and tended to increase the feeling of unreality naturally connected with any maneuver. Although the utilization of emergency fields will no doubt reduce the existing high percentage of completed missions, which in case of the San Antonio maneuvers, was 98.8%, the exigencies of campaigns make such practice imperative.

In future exercises involving air and ground forces, greater consideration will be given the protection of planes on their airdromes from hostile air attack. These protective measures will include the use of camouflage, and the scattering of planes to take advantage of local shelter.

Edgewood Arsenal to Have Beacon

The War Department has approved the request of the Airways Section, Department of Commerce to erect a type "A" Airway Direction Beacon at Edgewood Arsenal, Md. This beacon will consist of a fifty-foot tower, with a twenty-four inch revolving searchlight and a concrete arrow fifty-five feet long by twelve feet wide, flush with the ground, to indicate north and south.

The installation and maintenance of the equipment will be a function of the Department of Commerce. Edgewood Arsenal is on the direct Washington-New York air route.

To Cooperate with Department of Commerce

The War Department has completed arrangements for extensive cooperation to be given by the Army Air Corps with the work of the Aeronautics Branch of the Department of Commerce.

Arrangements have been made at the depot of the Air Corps at Fairfield, Ohio, to overhaul, adjust and install newly devised equipment in certain air mail planes and equipment, recently taken over by the Department of Commerce from the Post Office Department. This work includes the installation of engine, starter, wheel brakes and remodelling of certain parts of the plane itself.

The War Department has extended authority to the Department of Commerce to utilize its facilities for the repair of parachutes. The Air Corps has a parachute section at practically each of its larger stations throughout the United States where parachutes may be inspected, drop tested and repacked. At Air Corps depots extensive facilities for the repair of parachutes are maintained.

In order to facilitiate the photographic work which the Department of Commerce is doing in connection with its efforts to build up various aids to aerial navigation, arrangements have been made whereby the Army Air Corps will make available the facilities for the development and printing of pictures and for the adjustment and repair of aerial cameras.

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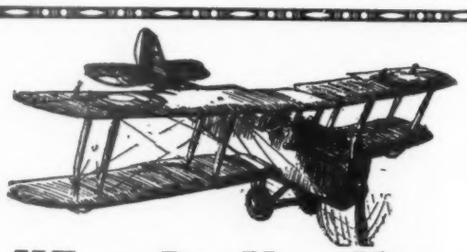

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Mechanical Engineering Section

THE ENGINEERING INDEX presents each month, in conveniently classified form, items descriptive of the articles appearing in the current issues of the world's engineering and scientific press of particular interest to mechanical engineers. At the end of the year the monthly instalments are combined along with items dealing with civil, electrical, mining and other branches of engineering, and published in book form, this annual volume having regularly appeared since 1906. In the preparation of the Index by the engineering staff of The American Society of Mechanical Engineers some 1200 technical publications received by the Engineering Societies Library (New York) are regularly reviewed, thus bringing the great resources of that library to the entire engineering profession.

Photoprint copies (white printing on a black background) of any of the articles listed in the Index may be obtained at a price of 25 cents a page. When ordering photoprints identify the article by quoting from the index item: (1) Title of article; (2) Name of periodical in which it appeared; (3) Volume, number, and date of publication of periodical; (4) Page numbers. A remittance of 25 cents a page should accompany the order. Orders should be sent to the Engineering Societies Library, 29 West 39th Street, New York.

AIRPLANE PROPELLERS

Design. Some Notes on the Design of Airscrews, F. S. Barnwell. Instn. Aeronautical Engrs.—Jl., vol. 1, no. 5, May 1927, pp. 56–77 and (discussion) 77–83, 6 figs. Deals with simple blade-element theory; means for determining effect of body on tractor air propeller and effect of air propeller on body; metal propellers.

Geared-Down. Geared Down Propellers and Efficiency of Commercial Airplanes, R. M. Mock. Aviation, vol. 22, no. 22, May 30, 1927, pp. 1137–1140. Better performance attained in spite of increased weight.

Metal. Metal Propeller Development, E. G. McCauley. Aviation, vol. 22, no. 22, May 30, 1927, pp. 1127–1130 and 1144, 10 figs. Extensive test work responsible for present efficiency of metal propellers for aircraft use; detachable blade; composition of aluminum alloy.

Sections. Characteristics of Propeller Sections Tested in the Variable Density Wind Tunnel, E. N. Jacobs. Nat. Advisory Committee for Aeronautics—Report, no. 259, 1927, 16 pp., 18 figs. Results obtained, besides providing data for design of propellers, should be of special interest because of opportunity afforded for study of scale effect on family of airfoil sections having different thickness ratios.

AIRPLANES

American. The Aircraft Industry at Bolling Field. Aviation, vol. 22, no. 20, May 16, 1927, pp. 1033–1038, 7 figs. 65 aircraft manufacturers exhibit at all-American aircraft display; review of exhibits indicates progressive state of industry; aircraft manufacturers.

American Eagle. The American Eagle Commercial Plane. Aviation, vol. 22, no. 23, June 6, 1927, p. 1240, 2 figs. Outstanding design that involves several individual and distinct features which reduce maintenance; direct steel-tubing aileron control is positive, control wires, pulleys and accompanying friction being wholly eliminated; tail skid can be removed to re-wrap shock cord by removing two bolts which are easily accessible.

Bach. The Bach C-S-1 Cabin Plane. Aviation, vol. 22, no. 22, May 30, 1927, p. 1135. Three-passenger enclosed-cabin machine designed for private owner; simplicity and ruggedness are features; powered by 120-hp. super Rhone radial air-cooled engine.

Bellanca. The History of the Columbia. Aviation, vol. 22, no. 26, June 27, 1927, pp. 1430–1431, 2 figs. Facts and figures on construction, performance and records of the New York-to-Germany plane.

Bonney Seagull. Bird-Like Design Features Bonney "Seagull." Aviation, vol. 22, no. 24, June 13, 1927, pp. 1290–1291, 3 figs. By reproducing same aerodynamic characteristics as those of gull, L. W. Bonney expects to give his plane similar performance; independent movement of wing sections; entire wing of duralumin; dual side-by-side control.

Canadian Industry. The Canadian Aircraft Industry. Aeroplane, vol. 32, no. 19, May 11, 1927, pp. 534, 543–544, 546 and 548, 5 figs. Types of planes developed in Canada.

Chance Vought. Chance Vought Products Maintain High Standard of Quality and Performance. Aviation, vol. 22, no. 24, June 13, 1927, pp. 1278–1279. From original VE-7 model to new "Corsair" which holds four world's records, soundness of design has been governing factor; Corsair is designed around

THE ENGINEERING INDEX appearing in the August 1927 issue of Mechanical Engineering, a monthly journal published by the American Society of Mechanical Engineers, described 56 articles pertaining to aircraft, aeronautics, etc. The articles were from "the current issues of world's engineering and scientific press." Below is an analysis of their origin:

AVIATION	24
Other American aeronautical publications	0
Foreign	20
Bulletins of N.A.C.A., etc.	5
American Publications other than aeronautical	7
Total	56

43% of all the articles pertaining to aircraft, aeronautics, etc., were from AVIATION.

67% of all these articles published in America were from AVIATION.

100% of these articles taken from the American aeronautical press came from AVIATION, or in other words, no other American paper dealing with aeronautics contained articles described in The Engineering Index.

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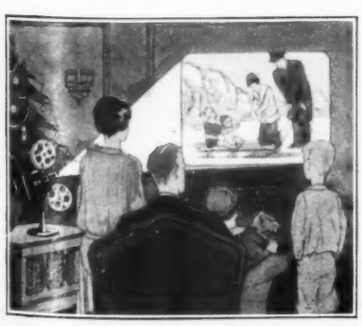

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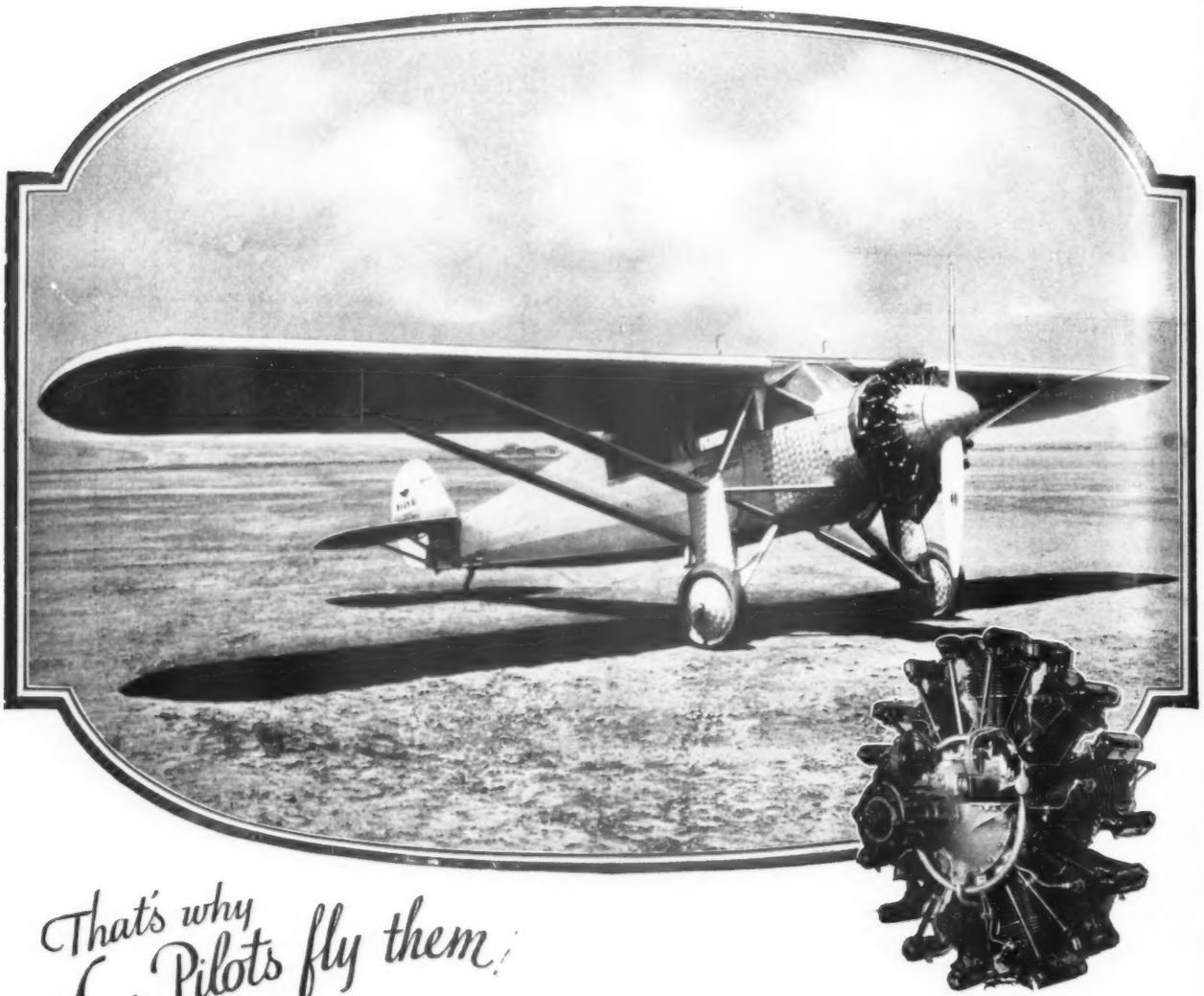

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